SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

No. 1671.—VOL. XXXVIII. LONDON, SATURDAY, MARCH 28, 1868. {STAMPED .. SIXPENCE. UNSTAMPED, FIVEPENCE.

Royal School of Mines, Jermyn-Street.

MR. WARINGTON SMYTH'S LECTURES.

[FROM NOTES BY OUR REPORTER.]

LECTURE XLVII.—The last lecture had sufficiently exhibited the main principles which came into operation with the safe and economical drawing or winding of the mineral up to the surface, and he (Mr. SMYTH) would, therefore, pass to another part of the subject, of a purely mechanical character, but in which a certain amount of mining experience was necessary. He alluded to the occurrence of water in mines, and the modes of getting rid of it. The water found in mines was derived from several different sources. He had already pointed out, in connection with "tubbing," the way in which it was sometimes derived from sand or gravel in immediate contact with the works, and at other times how it came from long distances through pervious beds; and that, as a rule, it was more difficult to deal with it in metalliferous mines than in stratified deposits. In either case, however, it must be raised to the surface, or at least to an adit, or water drain. It was noticeable that after a given time the water would drain from the ground over a level, and the natural tendency would be for it to accumulate in the lowest sumps or portions of the works. It might be a very injurious thing to have all the water at the bottom of the mine, and it was a great matter to intercept the water at the highest point, so as to lessen the cost of pumping it out. They had already considered the means of keeping water out of the shaft by "tubbing," but with respect to the mines themselves other means must be used. When watery measures communicated with each other through a whole district, the water might be got rid of on a large scale by driving an adit level; and when carried on by a Government or a combination of owners, &c., so that the expense would be covered by a royalty on the mineral obtained, each person benefitted thus contributing his fair share, it was an admirable system. This, however, could not often be done; and, then, when a certain area of orey ground was divided into different properties, it was a serious thing to decide upon the course to be pursued. Supposing such an area to be divided into three properties, if the man who held the centre piece put down a pit, it might entail upon him the cost and labour of pumping dry, not only his own but his neighbour's portion of the lode. No man, then, would attempt such a course unless his own portion of the workable area was large enough to remunerate him for the great expense he must be put to under such circumstances. Considerations of this kind were of the highest importance in highly watered districts, and mining engineers must be especially careful to look before they leaped in respect to them. In getting rid of the water, or of keeping it from the workings, a great many operations came into play. In some cases, where it was of vital importance to keep out the water, if was effected by DAMS, whether placed horizontally or vertically. During the last year he had seen two or three interesting cases, in which everything depended upon the thoroughness and soundness with which the system was carried out. If the work done was not trustworthy the dammed up water would be, like the sword of Damocles, continually threatening the whole of the mine with destruction. Hence the proper placing and construction of the dams, and the form they ought to take, were questions which tasked the judgment and skill of the mining manager in no ordinary degree. Dams were constructed in many different ways, according to the pressure of the water. Thus, having selected a narrow part of the level, where the ground was of a very strong character, they should cut a niche in each side of the level, and put in timbers from side to side, which should be made watertight, by filling in moss, &c. The dam should be planned according to the height of the column of water, or the pressure to be withstood. If there were a constant flow of water in the level it would be necessary to put a pipe in temporarily, to carry the water off during the erection of the dam. Another point requiring attention, and which was extremely important, was to extract all the air from the back of the dam prior to closing it up, otherwise its stability would be very much impaired. It was also of the greatest importance in selecting the place for a dam to ascertain that the ground above and below was very strong and impervious, so that the water should not infiltrate through it, and so get at the portion of the level which it was desired to keep free from water. The "frame dam," which was a good deal employed in the North of England and in Saxony, was capable of withstanding great pressure; but, whatever the kind of dam, the work must be of the strongest and most careful character. If the work were at all unsatisfactory, the probability was that the dam would give way, and might lead to the loss of scores of lives. Thus, when a new dam was brought into action it was watched with the greatest anxiety by the engineers, to see if it were capable of withstanding the pressure to which it was subjected. Where the pressure was not very considerable he had seen, as in Westphalia and in our own country, very efficient dams constructed of arched brickwork. He described by drawings several modes of construction, and then passed on to discuss the vessels in which the water was raised when pumps were not put in. These were, in the earliest stages of a mine, barrels and kibbles of various kinds, raised by manual labour and the windlass, by horse power, or by water and steam power. Barrels or kibbles for this purpose were often made of sheet-iron, and were sometimes of large size. They were often fitted with contrivances for filling and emptying, and as often were self-acting in those respects. Leather buckets were found useful in stream workings, and gutta percha buckets were greatly used where hand-pumps were in vogue.

LECTURE XLVIII.—Whether the water were kept out by tubbing, or raised by buckets or pumps, it must form a very considerable proportion of the first charge of working the mineral sought for; but having allowed a given sum for tubbing, or for pumping engines and apparatus, that estimate might in stratified deposits be easily reached. In metalliferous mines the case was different, because as they were constantly increasing in depth the probability of cutting new feeders of water was continually arising. They might start with a certain engine power, enough to deal with a given influx of water, but they could not be sure that that would serve for a single year, unless, indeed, they had put in a much larger power than was needed for the moment. So long as their operations were carried on above the level of the adit they might, even in a metalliferous mine, calculate to a nicety how much they must expend in drainage, but when they got below the adit level they entered the region of uncertainty, which was the cause of so many great disappointments. It was comparatively easy to calculate on the average hardness of the ground to be worked, the average cost of ventilation, and generally the average expenditure required in other matters, and expectations based upon these calculations might appear to be feasible, and reasonable hopes of profitable returns might be entertained, but so soon as they got below the adit the penetration of watery beds, not reached before, would greatly multiply expenses, and the most experienced miner might be foiled in attempting to estimate the charges into which they would inevitably be drifted.

Of the construction of pumps, and the means by which they were brought into work in the shaft, or near where they were placed, a few words would be necessary. With respect to pumps in shafts, there was a wonderful contrast to be found when the mine was worked by inexperienced persons and by those who had paid much attention to the lifting of water. The rude adventurers of America, for instance, whose idea of mining was making a hole at a certain angle of inclination, and then, when the water was unmanageable, beginning again at a fresh place, when they used a pump at all had apparatus of the commonest and least efficient sort; and in the same way the works of some of the Greek adventurers in Asia Minor were almost ridiculous, when the advances made in other lands were remembered. They dug out the mineral by means of a sort of inclined shaft, and where the water could not work at all. The simple expedient of an adit, for which the nature of the ground offered great facilities, did not appear to have suggested itself to their minds. In this country pumps were now generally in use. The quantity of water finding its way into a mine would always be different at different levels: a great portion might generally be taken up at the shallower levels, and, therefore, every mine manager would aim at pumping from the shallowest points, so as to have the calibre of the pumps, and the whole of the machinery connected with them, of the smallest dimensions. If they took the case of a shaft of 200 fms., the pumps should be for the first 50 fms. 18 in. in diameter, the next 50 fms. 14 in., the third 10 in., until at the bottom it would, perhaps, be only 6 inches. But still circumstances would vary as to water getting in, and provision must, therefore, be made for a heavier amount of water, supposing such an emergency should arise. With regard to the pumping apparatus, and setting it to work, it was an extensive subject, on which he could not pretend to say much. The system formerly employed was to raise the water by successive lifts, of about 30 ft. each. At every lift the water was delivered into a cistern, placed across or at the side of the shaft, and so brought up from one to the other, until it was finally delivered at the surface, and there got rid of. All these pumps—or rather sections of pumps—were worked by one main rod, which was set in motion by the power applied at the surface, and in deep mines it would be readily conceived that the power required was very great. These common, or drawing suction pumps were at length converted into bucket lifts, by the simple expedient of increasing the height of the collar above the piston, and so making the bucket-rod work inside a column of pumps, or "trees." Two hundred years ago, and in some places down to within the last fifty years, the different portions of the pump were made of timber, and this was yet so impressed on the minds of the people in the midland districts, that they used to this day the term "pump *trees*," whereas in Cornwall they went by the name of "culm," or column. As only 32 ft. of water could be raised by atmospheric pressure, it was necessary to add to the length of the pipe, so as to include in each lift a reasonable quantity, the length of the lift being only a question of the strength of materials, and the rod was often extended to a length of 80 ft. In working the pumps, care should be taken to keep them working "solid," and not to continue their action when the water was too low in the sump, as then dirt and air were brought up, and the power wasted; although the admission of a small quantity of air was not unfavourable to the working of pumps. There were some remarkable instances of long lifts in Prussia, and other localities on the Continent, where pumps had been put down to depths of from 200 to 300 fms. One of the most important kinds of pumps was introduced into mines at the beginning of the present century, called the "plunger." It consisted of a plunger-pole, or ram, which was worked through a stuffing-box into a plunger-case of bored cast-iron, and at every down stroke forced the water upwards through an upper clack, and the clear column of pipes above it. A great advantage of this arrangement (over and above the much smaller degree of wear and tear) was that the engine had simply at each stroke to lift the rods and the plunger-poles. These then, in the down stroke, by their own weight descended and forced the water before them; and inasmuch as the weight of the rods was far more than sufficient, in a deep mine, for this purpose, they were in part counterbalanced by "balance-bobs," placed some at the surface, and some at intervals in the shaft, each laden with 10 to 20 tons of old iron. In the Tresavean Mine, at a shaft that was 348 fms. deep from the surface, the 86-inch cylinder engine used to raise a weight of rods, plungers and sets-off for mine lifts of 67 tons 3 cwts. The main beam, with its gudgeons, connections, &c., 50 tons; four balance-bobs, 60 tons; the four loaded balance-boxes, 80 tons: or altogether, besides the weight of water in the drawing lift, about 260 tons, was set in motion at every stroke of the engine. In Cornwall the arrangement was universally the same. From the end of the main beam, projecting over the engine-shaft, a single rod passed all the way down to the bottom, or bucket-lift. Employed in its maximum strength at the surface, where it had the full weight to sustain, it was then tapered or diminished downward, according to the diminution of the strain by which it was affected. Thus, in a deep mine a main-rod of 290 fms. long was made for the first 120 fms. of two 12-in. square Riga balks, and afterwards one of 15, decreasing to 14 in. and 12 in. At the requisite intervals the plunger-poles were attached to it by sets-off, bound to it by strong staples of iron. The several lengths of rod, generally from 40 to 70 ft. in length, were connected by the aid of strapping-plates of hammered iron, from 9 to 12 ft. long on opposite sides of the rod, bolted through it by screw bolts. Very fine machinery of this kind might be seen at Wheal Abraham, where timbers of suitable strength, 90 ft. long, were put in.

LECTURE XLIX.—Mr. SMYTH proceeded now to add a few words with respect to the main pump-rod, and first as to the necessity of having some means of counteracting the excessive vibration to which it was liable in working. This was done by means of guides placed at various intervals in the shaft. In cases of slight deviation from the perpendicular, it was sufficient to insert iron rollers in the guides, but when they came to any great angle something more was required. For instance, in Cornwall, when they sunk a shaft on the lode for exploratory purposes, they often found that after a time it was necessary to leave the lode and continue perpendicularly, and then after a time to make another angle, and go on the lode again. When these angles occurred the difficulty was obviated by an ingenious arrangement called the "angle bob," or beam, which he described by means of drawings. Another point of great importance with regard to accidents required consideration, and that was the fracture of the pump-rod. They might think it was impossible, seeing the tremendous strength with which these rods were often constructed that such a thing should happen, but, on the other hand, the weight suspended sometimes in shafts quarter of a mile deep, was enormous, so that however strong or however good the material, such a catastrophe as the fracture of the pump-rod was by no means an impossibility. To lessen the effect of such an accident, it was usual in Cornwall to apply catches so as to prevent the fall of the rod if broken to a greater distance than the length of its stroke; and also to prevent the upper part thus suddenly released from so vast a weight from flying upwards. These precautions could not be too strenuously enforced, as their neglect involved the most serious consequences, utterly destroying, it might be, all the works below, and perhaps ruining the shaft, or, on the other hand, greatly injuring the machinery and buildings at the surface, to say nothing of the risk in each case to human life. He had already mentioned the application of steam-power to these pumps, and the mining engineers ought to know something of the peculiarities and capabilities of the different kinds of engines, so as to make the best choice. In some, called bull engines, from their inventor, the piston worked in a cylinder placed immediately over a shaft. They had great simplicity of action, and were working with excellent effect; but they did not attain an equal amount of economy to that attained by the beam-engine. They were, however, to be seen on a large scale at the Mostyn Collieries and at Messrs. Crawshay's iron mines in the Forest of Dean, working pumps of no less than 27 in. in diameter, with a 10-in. stroke, six strokes a minute, lifting the water from a depth of 120 yards. The same style of machinery was used at the Grand Hornu Colliery, on the Continent, and elsewhere. Its great defects were that there was difficulty in getting at the stuffing-box, so as to remedy any waste of steam which might arise; they did not get from it the same high amount of duty as that obtained from the beam-engine, and it occupied a much larger portion of the shaft with the apparatus. With regard to beam-engines, the question had arisen whether there ought to be a beam at all, or if so whether it ought not be of some other material than cast-iron. The disastrous Hartley accident had occurred through the fracture of the cast-iron beam, a mass of iron of immense weight, the larger fragment of which falling into the pit destroyed the bratticing, and so damaged the sides that the ventilation was destroyed, and 204 lives were lost. Since that time beams of cast-iron had been replaced by wrought-iron, of which latter material there had been some remarkably fine examples constructed. Some had been for various reasons constructed before that, chiefly when they had to be carried across a mountainous district, to avoid the risk of fracture by a fall. One of the best wrought-iron engine beams known was made in 1862 for the Clay Cross Collieries, in Derbyshire. The engine cylinder was 84 in. in diameter, the stroke 10 ft., and the beam, consisting of two rolled iron slabs, was 36 ft. in length and 7 ft. deep at the centre. These were the largest pieces of wrought-iron applied to purposes of this kind known; but north of Newcastle, and at the East Caradon Mine, in Cornwall, there were built beams of wrought-iron. These were formed in various ways, but chiefly by pieces of boiler-plate iron rivetted together so as to form cells, with a piece of the best faggotted iron carried around them. The lecturer then spoke of the various modes of transmitting the power when the pumps had to be placed at a distance from the engine by means of horizontal rods, and referred to a remarkable case at the Devon Great Consols Mine, where they worked up the brow of a hill for three quarters of a mile. He next referred to the modes of calculating the amount of work to be expected from well-constructed pumps worked by water or steam power. The quantity of water was calculated by a simple problem based on the diameter of the pumps, the length of the stroke, and the number of strokes per minute. It was first proposed to raise water by means of the steam-engine at the beginning of the last century, and Newcomen afterwards erected engines on a large scale in Cornwall and elsewhere. The improvements of Smeaton had greatly increased the amount of work done, but it was comparatively small until Watt introduced his separate condenser. At that time the work got out of an engine was from 7 to 8 million pounds raised 1 ft. high by the combustion of a bushel of coals. Watt's separate condenser at once effected a great saving, and he agreed with the mine owners that a certain proportion of the savings effected by his engines over the old ones should be his reward, and he thus realised a large fortune. The amount raised by a bushel of coals by Watt's engine was increased to 17 million pounds, and then Watt thought that improvement could go no further. Engineers and captains of mines in Cornwall, however, laid their heads together, and improvements made in one detail after another followed in rapid succession. These improvements were greatly stimulated by the commencement of those monthly reports of the work done by pumping-engines which had continued to this day, and which were a repertory of valuable information. He was sorry these reports were not so well known and attended to as they ought to be, and that not only Cornwall but other parts of the country were included. To the emulation thus created and fostered might be attributed Trevethick's tubular boiler, the jacketing of the cylinder, and other improvements to retain the heat, and obtain the most out of the fuel consumed and the steam generated, and the progress made was so considerable as to excite the greatest incredulity in other parts of England when it was announced that in certain Cornish mines a duty of 70, 80, and even 90 millions of pounds had been obtained per minute. The result was that a committee was appointed in about 1829 or 1830 to test these alleged performances of the Cornish engines, consisting of several scientific men, with whom were associated two or three pitmen, and their investigations were conducted with the greatest accuracy. They locked up the coal, and only allowed that to be used which was weighed in their presence. They examined the number of strokes made per minute, and measured the quantity of water delivered. One of the most remarkable of the engines thus tested was that at the Fowey Consols Mine, constructed by Mr. W. West. It was an engine of the largest calibre, and the mine was one of the deepest in Cornwall. Its work had been estimated at from 90 to 96 millions of pounds of water raised per minute for every 1 cwt. of coal, but the committee found that during the time they were testing it it actually raised no less than 120 millions of pounds per minute. It should always be remembered that the more unnecessary coal that was burnt the greater the wear and tear of the boilers, therefore every well educated colliery engineer ought to make himself acquainted with the engines that did the greatest amount of "duty," and the nature of those improvements of the apparatus that produced the greatest results for the smallest quantity of coal consumed.

LECTURE L.—Mr. SMYTH said that they had now arrived at the important subject of ventilation, on which there was, in the public mind, a great deal of misapprehension, which could only be set aside by learning what was actually done in our mines for that purpose. No sooner did any accident happen in which there was loss of life, than it seemed to enter into the minds of everybody that not sort of precautions were taken to prevent accidents, and that agents and viewers, and people who had passed their whole lives in working underground, had all the time lost sight completely of the necessity for ventilation. This only showed what complete ignorance of the facts prevailed. People seemed entirely unaware that it was to the constant study and labours of such men that we owed a system of intelligent ventilation, on a great scale, in our collieries and mines, which would favourably compare with the advances and improvements of any other branch of practical art. It would greatly surprise some of these critics if they were taken into a mine to find that, hundreds of feet below the surface, and at great distances from the bottom of the shafts, they would enjoy better ventilation than our lower classes in their small, close rooms, habitually dwelt in, and that the higher classes were content to endure for hours together, in ball rooms, at concerts, and in public assemblies, and to inhale air of a far more unwholesome and vitiated than would be found underground. He did not, however, deny that it was a subject of much difficulty, and that it taxed the whole energies and skill of managers and engineers to take care that the men were supplied at their work with a sufficient quantity of air. It was easy enough to carry air through the principal openings to great distances, but the difficulty was to convey fresh air through all the intricate, distant, and remote ramifications of the workings. It would, before describing the modes practised for this purpose, be necessary to occupy their attention with some remarks upon the gases it was the object of the mine manager to get rid of. As soon as a mine had been commenced, and a descent had been effected to a few feet, the necessity of ventilation would be felt, on account of the stagnation of the air. In consequence of this the air soon became vitiated, as the oxygen in it was soon dissipated by the breathing of the workmen, by the flames of the candles, by the explosion of gunpowder, and wanted renewing. This necessity was increased, and especially in deep workings, by the large quantity of oxygen consumed by the chemical action arising from the nature of the rocks pierced, and this to a much more serious extent than was generally supposed. Even the timber introduced for props and in various ways, absorbed in its changes of condition vast quantities of oxygen, and thus robbed the vital air of those qualities needed for the support of human life. Then, from the coal itself, there were not unfrequently emanations of carbonic acid, and still more commonly carburetted hydrogen—both deadly gases, which must be got rid of. It would, therefore, be obvious that, as these conditions varied under different circumstances, ventilation would be required in different proportions. Thus, in metalliferous mines, if left to itself, the natural ventilation would in many cases be sufficient, but in collieries the reverse was the case, and modes of artificial ventilation had been the subject of years of careful study and attention. Take such a mine, for instance, as that of Carn Brea; a glance at the ground plan would show how immensely difficult it must be to thoroughly ventilate such a vast reticulation of intricate and irregular passages and workings; but the difficulties would be seen at once to be different when they turned to the plan of a colliery. The necessities of each case differed exceedingly.

In a metalliferous mine the men worked singly, or in pairs, at the extremities of many galleries, and it might be sufficient to pass air to them through pipes, or a small ventilating machine may be put in, which would suck out the vitiated air, and throw in enough fresh air for the purpose; but in collieries where large numbers of men were employed together, and when the material worked gave out deleterious gases, a large, uniform, and constant system of supply was necessary. This being so, it was important to consider whether the air should be thrown in in an unbroken body, passing down one shaft, sweeping through the mine, and so away by the upcast shaft, or whether it should be broken up into portions, the supply being in each case for a section only of the excavations. This was often an important consideration, as there might be a portion of the mine which gave off noxious gases in large quantities, while the remainder might be free, or comparatively free, from such visitations, in which case there would be a manifest advantage, when it could be effected, in keeping the more dangerous part. With regard to the quantity of fresh air required, it must be remembered that they had to give breathing air to the men, burning air to the lights, and enough, besides, to sweep away all the noxious gases which might be collected in places where the ventilation had been allowed to fall in. Much more, then, was required in collieries than in metalliferous mines, where they had commonly, in works of size, eight or nine shafts, all contributing in some way, and in a greater or less degree, to the ventilation of the works underground. In collieries very large areas indeed were often worked with a pair of pits only, and that alone rendered necessary a very different system to that common in metalliferous workings. This arose from the enormous cost of putting down shafts in difficult ground to the depth of from 200 to 300 fms., which, if repeated in respect to a given get of coal, would put an addition of so much per ton upon the saleable produce as to swallow up all the profits. He would always recommend mining engineers to consider well the cost of their pits in relation to the probable get of coal, and to see how much per ton it would be upon the saleable quantity. It must not be supposed, however, that the difficulties of ventilation in very large workings were insurmountable, as it would frequently happen that large collieries were better ventilated than small ones. Another difference in the treatment of metalliferous mines and collieries arose from the fact that the former were chiefly located in hilly districts, so that 30 or 40 fathoms from the surface might be attained with the aid of natural ventilation, which was easily produced by the currents arising from the various adits and openings, and the difference in the elevation at which the works of the pits were placed, which was often as much as 30 ft., 40 ft., or even 50 ft. In colliery districts, on the other hand, the surface as a general rule was flat, and the mines were worked by two pits, contiguous to each other. With regard to the gases, &c., found in mines, and the difficulties they presented to the miners, it would be well to review them a little in detail; and one of the points which it was important to consider was their relative specific gravity.

First came water, which flowed along the floor of the level; next came sulphurous acid; upon that would be found carbonic acid (specific gravity 1·524); above that atmospheric air, occupying, as it were, the middle line; next in order came carbonic oxide (specific gravity 0·970); above that would come sulphuretted hydrogen, the hydrogen of which the specific gravity was 0·976; and, lastly, carburetted hydrogen. If they had to consider the gases as occupying different portions of the mine they must recollect—for this was a point most absurdly neglected—that if any of these lighter gases happened to be present in the deeper workings than those who would suppose the men to be working in, they would have a tendency to rise up into the position of the heavier gases, even if they had a seam of coal or shale, which gave off carburetted hydrogen below a well of water, such as a sump, the lighter gas would tend constantly to rise through the water, and get into the workings above. Many explosions had occurred from ignorance of this, it being generally supposed that water was a positive barrier to the passage of gas. This was a very fallacious notion, as was proved by the circumstance that gas had, in some cases, bubbled up through a deep river, and been set fire to at the surface. The burning springs afforded examples of this phenomenon. The first gas they would treat of was *carbonic acid*, which from its great specific gravity was always inclined to accumulate in the lower workings. If this gas were present in the proportion of from 5 to 8 per cent. combustion was rendered difficult, and if it became as much as 10 per cent. it was fatal to life. An extraordinary instance of the presence of this gas in considerable quantities occurred at a colliery at Pontgibaud, in Central France, where the most powerful ventilating apparatus was required to carry it off, notwithstanding which the men were occasionally obliged to leave their work on its account

This was an exceptional case; but, nevertheless, in many of our collieries they might have such an exudation of this gas as to put out the lights. Lime-water had been sometimes used to get rid of this gas, but a strong current of air was best. *Sulphuretted hydrogen* was a most poisonous gas, but it did not often occur; it had been recognised in the Whitehaven collieries, where it was given off by a decomposition of iron pyrites, and bubbled up from the old workings. In the Towdly Colliery the men cut into a feeder in the stone drift, which contained a great deal of this gas, but it was nowhere found if the water was fresh. With regard to the middle stratum, composed of the *common air*, it must be considered in various ways. The miners called everything "damp"—black-damp, white-damp, fire-damp, and so on; but what they meant was the common air vitiated by being deprived of a portion of its oxygen by the breath of men, by powder-smoke, and by a great number of chemical agents in the rocks through which the levels were driven, brought into a state of activity by their tendency to decompose. *Nitrogen* might be described as the atmospheric air deprived of its oxygen. *Carbonic oxide* was a production rarely to be met with in collieries, but it should be guarded against, on account of its poisonous properties; and it was strongly suspected, if not proved, to have existed in the mine at the time of the great Hetton explosion, some years ago. *Carburetted hydrogen* was what was here called fire-damp, and was designated by the French miners *grisoux*, and by the Germans *schlagendus wetter*. If it exuded in a pure state it might be set on fire without danger, and it burned with a pale blue flame; but if it were mixed with from four times its bulk of atmospheric air it would explode, and most violently when there were from seven to nine times its bulk of air mingled with the fire-damp.

Those accustomed to fire-damp were aware of its different qualities and powers, according to the proportions in which it was present in the air. But other gases were often mingled with it besides common air, and therefore their judgment could not always be depended upon for safety. It was often given out from the coal by simple exudation, in which case its quantity could be calculated, and its removal regularly provided for by ventilation. But sometimes, in certain portions of a coal seam, and particularly in the neighbourhood of faults, it occurred in the shape of blowers, when it poured into the mine in quantities so incredibly large as in a few minutes to fill the whole of the workings, and then, if the ventilating arrangements were not what they ought to be, or the lamps of the miners were in bad condition, or naked lights within its reach, there must be a great calamity. This gas, from its specific lightness (0·55), had a tendency to accumulate in the higher parts of a mine, and no man ought even to be allowed to go into the higher workings without each place being most carefully examined by the proper officer of the mine for that purpose. Wherever there was laxity in this respect there was danger. In metalliferous mines this gas seldom occurred, but remarkable instances of its presence did transpire from time to time, when the ground approached the character of the coal measures, and in the black shale and other beds connected with the carboniferous limestone. Cases of this kind had occurred at Talargoch, in the Hartz, and more recently in Wales, and at Okel Tor, on the banks of the Tamar, where a reservoir of carburetted hydrogen was suddenly broken into, and an accident occurred. It had been stated that this gas was sometimes associated with some of the arsenicated gases, in which case it must be extremely pernicious; but this had not been satisfactorily proved. Considering how much decomposition of material went on in mines, the presence of such gases was, however, extremely probable. Besides these gases *watery vapour* was also present in mines to a great extent, and it was as much desirable to get rid of that as of the deleterious gases.

Original Correspondence.

TECHNICAL EDUCATION—No. II.

SIR,—I was quite aware of the new minute on this subject, issued by the Committee of Council on Education, relating to the three descriptions of prizes offered, when I last addressed you; and I quite concur with you that it is a step in the right direction—a step which will have the effect of qualifying a few, at least, in mining discricts for filling offices of trust. This, however, does not come up to my view of what is required; still it is wise to proceed by degrees, as the mind of the country is prepared for it; and great credit is due to the Committee of Council for thus early taking the course they have done. My views may be regarded as extreme by proprietors of mines, and employers of labour generally, but that is no reason why I should not state them: it being desirable that the question should be looked upon and studied from various points of view, and that the public should know the opinions, not only of those by whom the boon of education is to be conferred, but those also of persons for whom it is intended. From either of these stand-points thoughtful minds must be impressed with the fact that there is amongst us a growing recognition of the dignity of labour, of an equality of social condition, and of the fact that each grade should be put into possession of all the advantages legitimate to it. This is, perhaps, the most discernable tendency of modern times, and various important circumstances concur to make it the great task of this age to tend and direct such feeling into proper channels, otherwise that which is healthy in itself may become corrupt, and break out into certain forms of disease, of which Trade Unions, Socialism, Communism, or other isms, are but the symptoms. Investing men with the elective franchise is going but a short distance towards a recognition of the force of this tendency: the privilege of delegating to the Imperial Parliament someone to watch over their interest is an act only occasionally performed, whilst to get their own living in that line of life in which they find themselves placed entails daily duties and important qualifications. The one is the mere shell and husk, and the other the root and kernel, of a working man's well-being, entailing a discharge of duties every day growing in magnitude and in importance. It is no longer according to the "fitness of things" that the chiefs of labour only should be intelligent, and the masses of workmen ignorant; a progressive revolution is taking place, eliminating old errors, opening up new ideas, and rendering extensive culture necessary. So that henceforth it will absolutely depend upon the means of culture provided whether the constant addition to humanity in the lower walks of life shall—like the bright, sportive streams of slag issuing from our furnaces—become unyielding, hardened masses of useless lumber, or whether—like that of the pure metal—it shall retain its placidity, and ripen into a useful manhood. It will depend upon the means, upon the kind, and upon the extent of the culture provided whether our criminal returns are to go on swelling, and that host of idle, incapable paupers (who prey like locust upon honest industry) are to continue increasing, or whether we shall add to the true army of labourers those who shall fittingly sustain and increase the credit of our national industry.

Carlyle, whose capacious mind gives him a giant's power to grasp a fact, says—

"It strikes me dumb to look over the long series of faces that any full church, court-house, or tavern meeting, or miscellany of men will show. Some score or two years ago all these were little red, pulpy infants, capable of being kneaded into any social form you please, yet you now see them fixed and hardened into artizans, artists, clergy, gentry, learned sergeants, and unlearned dandies, that can and shall be nothing else henceforth. There is no sight more depressing than to see men false to their nature, forfeiting their high privileges, sinking into helpless agglomerations, that can neither bend nor grow, fit only to be trampled upon and broken into pieces during the onward march of progress."

As the talented member for Calne, quoting from Plato, remarked some time last session, "There is nothing more pitiable than to be ignorant of one's ignorance;" and there is no injunction the philosophers of old have left for our guidance more important than that which Mr. Gladstone, in reply, referred to as being placed over the entrances to the temple of Delphos:—

"To know ourselves, to know something of the things surrounding us, to be able to fit in and take our places, making them to administer to our happiness and the happiness of others, is, as regards this life, the most important business which concerns us. It matters little what a man's position among the man-made grades of society might be, his acts and doings, down to the unloosing of a shoe latchet, are dignified and sacred, if the performance is from a proper motive, and done in a proper manner."

But "to be able to fit in and take our places" with advantage to ourselves and others requires an efficiency which can only come with a higher average of general intelligence, and a special preparation for our tasks. The old hackneyed phrase of a popular poet—"A little learning is a dangerous thing"—can scarcely be said to apply to technical, if to general, education. Nor can it be said to encourage insubordination or discontent, by lifting the men above their employment. On the contrary, its *tendency is to raise the man's employment to a level with himself*. Skilled labour is every day rising in the market, and in divisions of industry where brute strength was formerly considered the chief requisite an elementary knowledge of art or science is often of more consequence, both to the possessor and to the employer. In agriculture even science has effected such changes that the agricultural labourer who commands the highest wages is no longer he who has most bone and muscle power to work a like machine, but he who has knowledge enough to tend the machine with which he has to work. In mining, too, machinery is gradually being introduced to supersede mere labour, and as mind continues to triumph over matter it will be more so. The great question for us to consider is whether we are to continue to keep up the *prestige* we have hitherto enjoyed as first among the commercial nations of Europe, or to be satisfied with falling into the rear of France, Prussia, Austria, Switzerland, and the New England States of America.

The reports recently made by the various Chambers of Commerce on technical education, in reply to questions from the Privy Council, will, we imagine, prove rather startling, and convince "My Lords" of the urgent necessity of steps being taken which shall to some extent atone for past neglect; and during the discussion of the question which will soon take place in the House, it will be the duty of those interested in the two great industries of mining and metallurgy, upon the success and prosperity of which so many others depend, to take care that they receive a proper share of attention, because, notwithstanding the admitted superior natural advantages, as regards abundance and order of occurrence, and the pre-eminent experience in practical working, we now find ourselves in a very unsatisfactory position as regards several of those countries which have stolen a march upon us by adopting our discoveries and improvements, and are raising up a class of workmen who, by superior knowledge, are enabled to turn them to a better account than ourselves.

We are still at the head of the world in the quantity of coal and iron produced from the prolific womb of Nature; but whilst our workmen have shown an indifference to that specific knowledge which alone can qualify them for those multitudinous trades dependent upon the processes, combinations, and successful treatment of the manufactured article, those of other countries have been intent upon their own improvement in science and art, by which means they have been able to effect economy in material and effort, and given a beauty and meaning to their productions which those—the result of rote or imitation—must necessarily lack. Moreover, the foreign workman not only has the privilege of boasting that he has entered into competition with us in certain departments of industry which, heretofore, we had regarded as exclusively our own, but that he is enabled to perform his task with much more ease and pleasure to himself.

The argument in favour of special trade education is strengthened by the fact that the marked improvement in French manufactures followed almost immediately upon the stimulus which State aid and private beneficence applied to the schools. We have, in various ways, improved the means of general education, but have we offered sufficient inducements to tempt boys to remain long enough at school for special instruction?

In the South Staffordshire and Shropshire mining districts the iron and coalmasters some time ago very wisely instituted prizes, for the purpose of inducing parents to keep their children at school; but they made the very great mistake of awarding them for anything but a proficiency in those very branches of knowledge which alone could qualify them for carrying on efficiently the processes in which they were likely to be employed when commencing the active duties of life. Mr. Wynne, Her Majesty's Inspector of Mines, in one of his admirable reports, very justly says:—

"It is the practice of school committees to appeal to manufacturers to give a preference to such boys as remain to obtain a prize, but why should they do so? There is nothing taught that will make him more forward in the branch of mechanics or other skilled labour he may select; he may be better fitted for a clerk, and much better fitted to fulfil the duties of manhood, but *as a miner, a furnaceman, a puddler*, or *for any other industrial occupation* he is not improved in the slightest degree by the sacrifices his parents have been making for two or three years in keeping him at school. The working man says 'Bible and Gospel history can be learnt at a Sunday School, and I want my child to be learning something by which he can support himself in case anything should happen to me.' Now, what I think ought to be adopted is a more useful education—something that shall fit the boy to become a clever man as well as a good one—that while he is improving his moral perceptions, he should acquire some knowledge of using his mental and physical powers to advantage."

I find you also, Mr. Editor, in your leading article in the *Mining Journal* for January 10, 1867, on this subject, saying:—

"Let us, by the establishment of *special* schools in all our mineral districts, endeavour to give to the children of our miners that *kind* of education which may fit them to take the places of their fathers when *they* rest from their labours. To read is all-important; we acquire a knowledge of truth from books; to write, is no less so, as it enables us to communicate our thoughts, and to preserve, for our own benefit, ideas as we receive them, which would sooner or later fade from the tablet of memory; to cipher has its great advantages, and mental arithmetic, especially, is of everyday use. It is, however, of moment that something beyond these should be taught to the young miner. He is to carry out some of the most hazardous of human enterprises, in which he is to be exposed to many imminent dangers. The four elements of the ancients and the miner are in antagonism; he compels fire to do his bidding in rending the rock, and fire often destroys him by explosion. Water and he are ever striving for the mastery, and success in the miners' labours depends upon his maintaining the rule. Air he must have to carry on his labours, and unless he knows how to train the invisible stream it often leaves him a victim. Earth is the giant upon which his toils are bestowed, and without some knowledge of its anatomy he may labour in vain, or he may but dig for himself a grave too deep for human rescue."

In the article from which this extract is made you also say, and say very justly,

"The education required for a working miner, and that which is necessary for a mine agent, captain, overseer, viewer (in fact, the practical director of the works, by whatever name distinguished), must be different in degree, and in many respects varied in character."

Still I see no reason whatever why opportunities should not be afforded to all who wish by a continuance at school, or by availing themselves of the teaching of professors of science at such district colleges as we contend for, of acquainting themselves to the fullest extent with the nature of the elements referred to, and with the mineral and geological character of the rocks, clays, and minerals of the earth in which they labour. To say nothing of the superior economy, safety, and value of the labour performed under the guidance of such knowledge, there would be a dignity about it, and a pleasure accompanying it, which would amply reward the labourer. Whether it be in the structure of the older rocks, in which, for the most part, rich mineral veins occur, or those more recent, which form the valued storehouse of our coals and iron ores, the monotony of labour in these subterranean recesses would be wonderfully lightened by an acquaintance with the agencies and processes by which they have been produced, to say nothing of a knowledge of the interesting forms of plants and animals they contain. JOHN RANDALL, F.G.S.

THE ELECTRIC TELEGRAPH.

SIR,—In last week's Journal you pay a just tribute to my brother, Mr. William Fothergill Cooke, as being entitled to occupy the same position in connection with electric telegraphy as does Stephenson in connection with the railway system; in that, as the originator of the practical enterprise, he was the first to pass the line which separates philosophical research and tentative experiment from practical realisation and public use. The following particulars connected with the two principal patents—that of 1837, which secured the needle telegraph, and that of 1840, which secured the mechanical telegraph, may illustrate the truth of your words.

It must be premised that the system originated by Mr. Cooke comprised from the first the reciprocal principle, by which instruments at any number of stations are attached to the same wires, and by which signals are exhibited to the signaliser as well as to his correspondent; practical methods of insulating the wires; a detector for localising such injuries as may occur to them; and an alarum to attract attention. For working this system, there were constructed for Mr. Cooke, to be secured by the first patent (that of 1837), two instruments with the single-needle movement, which from the first has prevailed in this country (being improvements on two instruments constructed for him at Heidelberg in 1836), and also two instruments of a mechanical form. To these was added at the last moment a pasteboard model of a dial, with five converging needles, invented by Sir C. Wheatstone, for engrafting on Mr. Cooke's system. The circumstance that this five-needle dial was prominently exhibited in the specification of the first patent (the superintendence of which had been undertaken by Sir Charles) was unfortunate, as endangering the patent in a court of law, and cannot sustain the representation which has been made that Sir C. Wheatstone was the first contriver of the electric telegraph in the form which made it available for popular use, especially as that form has never been employed.

The Voltaic magnet, on which the above-mentioned mechanical instruments depended, being in an imperfect state in 1837, those instruments were omitted in the first patent, being postponed, under advice, till the Voltaic magnet should be perfected. This being successfully accomplished by Sir C. Wheatstone in 1839, on the principle and in the mode sketched by Mr. Cooke in 1837, the mechanical instrument was patented in 1840 in two forms; one arranged by Mr. Cooke, the other by Sir C. Wheatstone. This, again, does not substantiate the statement which has been made on very high authority (confessedly without any consciousness of misleading, but in singular unacquaintance with facts), that Sir Charles was the hero of the patent of 1840; and not only so, but that an instrument of his was the only one secured, that Mr. Cooke was not associated with him in that patent, and that it was not considered in 1841 in the Brunel Award. The principle of these, and of all other mechanical instruments which have overspread the world, was originally invented by Mr. Cooke, at Heidelberg, for his alarum, in 1836.

The quick grasp of genius by which an invalided Indian officer, whilst enthusiastically engaged at Heidelberg in anatomical modelling, seized at sight the telegraphic toy of the philosophers, and shaped it at once into the practical system which the world had long coveted in vain, received a further illustration in the establishment of that system of suspended wires which has followed the telegraph through all lands. No sooner was the invention of galvanised iron made known than Mr. Cooke, on the invitation of the Galvanised Iron Company, became a director of that company, for the purpose of superintending those improvements in the manufacture of iron wire which he had himself proposed to adopt to his purpose. These hints may be sufficient to suggest that in this, as in similar instances, the Rubicon was passed by a great captain.

Johnstone-street, Bath, March 24. T. FOTHERGILL COOKE.

HYDROSTATIC BALANCE.

SIR,—Will some one of your correspondents kindly inform me which is the best and most approved balance for ascertaining the specific gravity of minerals and other substances, and the approximate cost of the complete apparatus? In Gregory's "Mathematics for Practical Men" I observe a hydrostatic "steelyard" is recommended in preference to a "balance." Is anything known of its superiority in this country—it being designed by Dr. Coates, of Philadelphia—and what is its cost? Such information would greatly oblige— L.

March 24.

ROCK-DRILLING OR BORING-MACHINES.

SIR,—My attention has been called to a letter from Messrs. Blanchard and McKean, in the *Mining Journal* of March 14, concerning Haupt's drilling engine. They assert that—

"The contractors of one of the most important tunnels now constructing in Great Britain have decided upon the Haupt machine as the best adapted to their purpose, and their selection was made after having personally examined all the other Rock-Drilling or Boring-Machines now in use in Europe."

The above statement, combined with the extensive puffing this machine has already received, may possibly impress some of your readers with the idea that Haupt's Driller is efficient, and has at least been practically applied. So far, however, is this from being the case, that I assert, without fear of contradiction, that no proofs whatever can be given of these engines having ever been of any service in the driving of any tunnels or levels in existence.

My machines, on the contrary, are in actual work at mines in this country, in France, and in Germany. I have also orders in hand for them in Belgium.

Through the medium of the Journal I take the opportunity of *challenging Messrs. Blanchard and McKean to a trial of the respective merits of my engines and Haupt's*.

I am now driving levels under contract with my engines in Tincroft Mine. Should the proprietors of this mine be willing, for the sake of bring matters to an issue, to run the risk of the delays which may occur in the driving of the level by the substitution of Haupt's engines for mine, I beg to suggest that Messrs. Blanchard and McKean send two of these former to Tincroft Mine, and that these and my engines be worked alternately a month at a time in a level for a distance of several fathoms at the contract rates, and for a wager of 200*l.* a side.

If Haupt's engine were the same as that exhibited at Paris and Falmouth I should not think them worth this notice; seeing, however, the tone of the letter in the Journal of March 14, it may be presumed that improvements have been made therein. F. B. DOERING.

Westminster Chambers, S.W., March 26.

POOR COPPER ORES.

SIR,—I duly noticed in the *Mining Journal* of last week the remarks of "Alkali" in reference to my letter on this subject, and as he requests a variety of information and details, I must again beg a short space in your columns, not to enter into those details he appears so anxious to obtain, but "to impress upon him that in a legal and technical struggle, such as is evidently approaching," it would be highly imprudent to divulge those facts which I doubt not, should the affair come to trial, will be brought forward and thoroughly sifted, and will, probably, form ample proof of the priority of other patents for all that is of value in Mr. Henderson's. I do not for a moment wish it to be understood as my opinion that all Mr. Henderson has patented for the extraction of copper was carried out previous to 1859, and should very much like to know where it is carried out in its entirety at the present time; but what I assert, and what I am willing to prove, if the matter be properly submitted to me, is that all, or nearly all, his patents contain, of any practical value, was carried out previous to 1859. Having no object in writing anonymously, I beg to subscribe myself— JOHN LONGMAID.

14, *Bishopsgate-street Without, London, March 24.*

TREATMENT OF POOR COPPER ORES.

SIR,—Your correspondent, "Alkali," in last week's Journal, wants to know where burnt copper ores were calcined about 10 years ago with salt? I beg to inform him that Solomon Mease and Son, Jarrow Slake, have been at that work for near, if not quite, that time; at all events, they have been at work with salt and burnt ores much longer than Mr. Henderson's works at Hebburn Quay. I remember quite well, nearly ten years ago, when Solomon's son came back from Manchester and North Wales, it was the talk in the works that he had seen the same process working well there; and it is certain they gave up their own invention, which never could be got to work well, and took to this plan, which has done first-rate. VITRIOL.

Jarrow, March 25.

TREATMENT OF POOR COPPER ORES.

SIR,—Knowing how the hard-earned success of Mr. Henderson in treating copper ores has attracted some who would profit by his brains, and seek to deprive him of reward, I read with pleasure in a late *Mining Journal* an article giving evidence of its author's keen appreciation of the true bases on which Mr. Henderson's patents rest.

Mr. Henderson has not escaped the unavoidable fate of the genuine inventor. He is pestered by a host of detractors, many of whom, like your correspondent "Poor Copper Ores," deny the originality of his discoveries. Did not Mr. Henderson discover that native oxide and carbonate of copper could be removed from an insoluble matrix by hydrochloric acid (Patent, 1857), that oxide of zinc could be separated from the matrix in the same way, and that sulphides calcined dead were no exception (Patent, April, 1859)? Again, did he not invent the volatility of chloride of copper, and forthwith work out a process to separate copper from its ores as smoke (Patent, December, 1859)? Finally, was it not left to Mr. Henderson to discover that when copper precipitate, containing silver, was heated the latter metal was changed to smoke, and might be caught again (Patent, 1860)? These selections from Mr. Henderson's numerous patents are sufficient evidence of genius, and need no words of mine. But when it is remembered that he has carried one process to commercial success, making copper that is stamped "pure," the number of his detractors is not surprising.

It is true that some (*e.g.* "Poor Copper Ores") talk of previous working of the process now adopted by Mr. Henderson, and point in proof to the patents, a quarter of a century old, of Mr. William Longmaid. This inventor, no doubt, specifies the condensation of the gases from the mixture of ore and salt in his furnaces, and the use of the condensed acid in washing the ore after calcination, but the chloride of copper volatilised—if, indeed, it were volatile in his day—must have passed sheer through his condensor with the coal smoke. Let them say that Mr. Henderson keeps his heat low, so as only to make a trace of copper into smoke, and thus deviates from his own invention; that a few bricks removed from the muffle furnace would make an open furnace, or no furnace at all; that the many (?) lawsuits, involving the validity of his patents, have ended in compromises, not very favourable to Mr. Henderson; that his crowning invention of the proportion of sulphur to copper is accidental; and that he barely makes the extraction of copper pay, but obtains his profit by the sale of purple (iron) ore. Let them say all these things, but we know better; and

if the iron ore is the profit, did not Mr. Henderson invent *it?* In the lawsuit now pending Mr. Henderson will doubtless, should he fail in bringing about a compromise, show to the world the true basis of his reputation as an inventor.—*March* 26. COPPER.

ON DECEPTIVE STATEMENTS OF THE PRODUCE OF SLATE QUARRIES.

SIR,—Permit me again to call the attention of your readers to a deceptive and fallacious mode of stating the produce of slate quarries, which can only be resorted to for the purpose of misleading investors. I had before denounced this practice in the Journal, and hoped it would have been discontinued, but regret to see it again appearing in some recent slate advertisements. I allude to stating the make of slate by *count* (say 40,000 *slates*), to make it look large to those who do not know this conveys no more idea of the real value than if a railway stated the traffic in so many coins (say 40,000 *coins*), without stating whether these were *pence* or *sovereigns.* Just so with slate. The 40,000 slates may be small ladies, some 40 tons, worth, if *seconds*, about as many pounds; or, if best princesses, above 150 tons, worth nearly 500*l.* Between these extremes are above a score of differences, taking *first* and *second* qualities. The first make of a quarry is naturally more in proportion of the smaller and inferior descriptions than of the largest and best; therefore, where intending investors see the make of slate quoted by *number* instead of a plain statement of *tonnage* and *value*, they may rest assured this is done to conceal an inconsiderable produce, and this should naturally cause them to look with suspicion on other statements in company with such an attempt to throw dust in their eyes.

London, March 23. A MAN OF EXPERIENCE.

THE PROGRESS OF MINING—AS A SCIENCE, AND SOURCE OF COMMERCIAL WEALTH.

SIR,—To an unpractised spectator of the depressed state of mining in Cardiganshire a third of a century ago it would naturally appear that this great interest had fallen so low that it could never again recover. The people seemed to have sunk into a state of contented poverty; the cottages were mere styes or sheds, covered with thatch, apparently attached to the fences. In the mines where anything like regularity of payments existed the miner was only settled with once in three months, his wages averaging very little above 20s. a month, and he and his family generally eked out a hard existence by tilling a little ground, combining farming upon the most limited and miserable scale with mining under its poorest phase. The whole mining districts, from which now lead ore worth 120,000*l.* to 150,000*l.* a year is sold, yielded barely 300*l.* a month. A little revival had taken place in the northern, or silver district, 10 years before this, or 43 years ago. It was said a series of mining legerdemain, of which we hear so much and see so little, was practised by the Cardiganshire mining community upon their benighted co-operators of Cornwall with respect to the great Cwmsymlog Mine, the mine that paid for bringing the water to London in the time of Sir Hugh Myddelton. If the oral records of this event are to be credited, it would appear that a wily old Derbyshire miner, who held the mine at that time, wished to dispose of it to a well-known rich mining house in Cornwall, but in order to do this to the best advantage to himself he had got the mine properly dressed for the occasion. The ore ground, consisting of a series of bargains, was being worked by underhand stoping under the adit, and the lode was generally too poor to pay for working, but still contained some good patches of rich ore ground. Under these circumstances, it is said he conceived and executed the design of working down all the poor ground to below a certain level, letting the pinnacles and peaks of glittering ore stand above, and when the Cornish agents come to examine the mine let in the water to a sufficient extent to cover all the dead ground, and in this way the mine presented the appearance of a channel of water studded with silver islands. The tradition goes on to state that these poor deluded, trusting, innocent Cornish agents, on seeing this bright prospect, could hardly conceal their joyful emotions, reasoning amongst themselves after this fashion:—"If those foolish poor Welsh fellows have left such borders of ore in the divisions of the bargains above water, what riches must be below!" The money was paid, the water drawn out, and the scales fell from the eyes of the unsophisticated Cornish party. For my part, I do not believe a word of such transactions.

I have been connected with mining for 40 years, and I have heard ever and again continually of such deceptions and chicanery. Who has not heard of instances such as Connorree, in Ireland, where the waste heaps were said to be covered with a thick coating of copper ore, for the purpose of deceiving the purchasers. My opinion is that miners, as a community, are as honest a body of men as exist on the face of the earth. The utmost of my experience of roguery extends to, perhaps, a party of miners claying and smoking the back of a tribute bargain, to get a little better price of the agents; and I have myself (for an honest confession is good for the soul), when working underground, bored a few short holes in the end against taking-day, to make it appear that the ground was a little harder, and the powder would not tear as much as it ought to do. But most agents are too practical for these subterfuges, and, after laughing at the trick, usually reduce the price a little, as our American cousins say, as a caution. In reality, I believe no deception or fraud, as a general rule, enters into the negociations for the disposal of mines; but, on the contrary, everything is carried on fairly and above-board, and I question whether agents do not more frequently undervalue than overvalue the appreciable points of mines under their inspection. In the instance of the great Cwmsymlog Mine, now East Darren (for the historical name of this mine has been unfortunately changed), there are now large courses of rich silver ore in the 80, 90, and 100 fathom levels, which came in about the 68, underlying the very ground where it is said the deception was attempted, so that if it were so it shows how futile the attempts of man to imitate the character of the works of Nature, for this ore ground is now paying thousands a year profit—Cwmsymlog forming one of the Goginan silver-lead district, in which, amongst others, are found Bronfloyd, South Darren (formerly Cwm Sebon), Great Darren, Cwm Erfin, Bwlch Consols, and others, which were all dormant at the time of the commencement of this narrative.

M. F.

SPLENDID RESULTS OF MINING—DOLCOATH MINE.

SIR,—Annexed I send you, for the information and encouragement of all *bona fide* shareholders, and the public generally, a list of dividends declared in this justly-celebrated and still profitable mine, with their respective dates, between 60 and 70 years ago—the produce then being almost if not entirely copper. It will be noticed that the account meetings were held *every month* for a long period. Similar profitable results might probably be recorded of many other Cornish mines if required, but where are there any existing mines to be found that can at all compare or approach it? Only fancy 7632*l.* profit on one month's working! (See June, 1809). It may be argued that there are as good fish in the sea as were ever taken out of it. Granted; but they have been very scarce and shy of late, and the sooner some specimens of the sort are discovered, hooked up, brought to grass, fairly landed, dressed, and sampled the better. In conclusion, I am happy to inform all parties interested in this good old mine, that there are no symptoms of exhaustion or decay, but that it continues to look healthy, vigorous, and fruitful, for a venerable matron of upwards of a hundred summers, and with tin at 60*l.* per ton would in all probability give 10*l.* per share dividends.

DIVIDENDS.

	£	s.	d.		£	s.	d.
1803—July	2000	0	0	1806—March	2326	10	3
1804—October	1500	0	0	April	2534	1	7
December	1500	0	0	June	2120	6	6
1805—February	1500	0	0	1807—June	1500	0	0
April	3000	0	0	1809—February	3000	0	0
May	3000	0	0	April	5028	19	3
June	4500	0	0	June	7632	14	1
July	2000	0	0	August	5011	16	2
August	5675	8	7	October	3625	11	5
September	4891	9	2	December	5029	11	3
October	2152	0	3	1810—February	2420	1	1
November	2057	11	9	April	1907	8	11
December	7058	10	10	October	1050	0	0
1806—February	4014	7	5				
Total					£88,036	11	6

Camborne, March 23. WILLIAM LANYON.

GOLD PRODUCT OF VICTORIA.—The yield of gold from the mines of Victoria for the year 1867 was 1,493,831 ozs. The average number of miners employed was 65,857, and the average earnings 35s. per week. The gold mining companies in the colony paid in the year 1867 dividends amounting to more than 820,000*l.*, being a much larger number of pounds sterling than the number of the entire population—men, women, and children. The amount would be very largely increased if there were added the profits of private mining undertakings, and of companies which do not make public their yields and dividends.

FOREIGN MINING AND METALLURGY.

The exports of coal from Belgium have been as follows:—

Destination.	1867.	1866.	1865.
Russia ....Tons	1,324	947	547
Zollverein	6,504	6,622	6,260
Low Countries	108,973	137,751	194,365
France	3,442,220	3,818,712	3,350,782
Switzerland	41	794	4,867
Turkey	—	—	—
Miscellaneous	5,326	6,946	10,866
Total ....Tons	3,564,564	3,971,772	3,567,687

It will be seen by this table that the amount of the exports of coal from Belgium in 1867 was less than in the two preceding years; at the same time the deliveries to France, the most important outlet of the Belgian basins, were larger last year than in 1865; on the other hand, the deliveries to the Low Countries are giving way more and more. The exports of coke from Belgium last year amounted to 517,000 tons, against 547,550 tons in 1866, and 502,500 tons in 1865. The deliveries of this product to France sensibly declined last year; but, on the other hand, they presented an important augmentation as regards the Zollverein. The importations of coal into Belgium were 423,000 tons last year, against 179,427 tons in 1866, and 73,931 tons in 1865. English coal figured in these totals for 169,089 tons last year, against 61,486 tons in 1866, and 17,809 tons in 1865; and Prussian for 191,228 tons, against 48,796 tons in 1866, and 1546 in 1865. This progressive increase in the imports of English and Prussian coal into Belgium deserves the serious attention of Belgian coalowners. The tone of the Belgian coal trade has not presented any material variation of late; orders for domestic qualities are less numerous than for some weeks past; but, nevertheless, prices are easily maintained. As regards industrial qualities of coal, the demand has not improved. In the Charleroi basin what is most feared is the impatience of certain coalowners, who will, it is apprehended, by precipitate offers infallibly bring about a fresh fall in prices. In Liége basin this state of things has already arisen, several contracts having been entered into by coalowners anxious to run off a part of their extraction. This proceeding has provoked a strong feeling of discontent among the competitors of the firms in question. In the basin of the Couchant de Mons the situation remains somewhat difficult. Freights have not varied, the quotation from Charleroi to Paris being 7s. per ton.

The production of coal in the Dortmund (Prussian) district last year was 10,366,035 tons, against 9,291,250 tons in 1866, showing an increase of 1,074,785 tons, or 11½ per cent. The value of the extraction effected last year in the district presented an advance of 15¼ per cent., as compared with 1866. The number of workmen employed in the district last year was 48,126, as compared with 47,300 in 1866, showing an increase of 846, or about 1¾ per cent. The production effected by each workman in 1867 was thus rather more than 215¼ tons, as compared with 196¼ tons in 1866. The stock on hand Jan. 1, 1868, was computed at 217,414 tons, as compared with 218,427 tons Jan. 1, 1867, showing a decrease this year of 1013 tons. It would thus appear, that notwithstanding the commercial depression which has prevailed in Europe, coal mining in the Dortmund district has continued in every respect to make progress. The statistics which we have summarised certainly afford another instance of the steady industrial advance which Prussia has been making of late years.

We announced recently that representatives of several eminent Belgian firms had left for St. Petersburg, in order to secure, if possible, an important contract for rails. This contract, which comprises both iron and steel rails, with their accessories, is understood to have been obtained by MM. de Dorlodot. The Belgian iron trade generally presents little improvement; indeed, casting pig has declined to 3*l.* 12s. per ton, with a scale of 2s. per ton per class. It is proposed to suppress the import duty now levied on pig imported into Russia; it was urged in some quarters that it was necessary to continue the duty, so as to protect certain works in Finland and the Olonetz district, but free trade arguments prevailed. This result is due not only to the progress of free trade ideas, but also to the proposed suppression of the tax now imposed on the indigenous production of pig. It has been considered, besides, in official quarters that the exemption of pig from duty, which has been accorded since 1860 to the promoters of railways in Russia, established an exceptional *régime* which gave rise to inevitable irregularities, as under this system the importation of pig free of duty has increased to a very considerable extent. It is proposed to levy moderate duties still upon rolled iron and plates, and a somewhat high duty upon steel. The annual consumption of iron in Russia is now set down at 12,000,000 pouds, a total which shows a considerable progress upon former years. A meeting of representatives of coalowners' committees formed in the various Belgian basins will shortly take place, in order to discuss various questions of general interest referring to the present state of Belgian coal mining industry. The Bonne-Fin Colliery Company will pay, March 31, a dividend for 1867 at the rate of 8s. per share. Meetings are announced as follows:—Sacré Madame Colliery Company, March 30, at Antwerp; Levant d'Eloges Coal Mining Company, March 30, at Paris; Peronnes Colliery Company, March 31, at Brussels; United Collieries of the Vallée du Piéton, March 31, at Roux; Eschweiler Mines and Foundries Company, March 31, at Blankenberg-Stolberg; Cappelle-sur-Yssel Rolling Mills Company, March 31, at Cappelle-sur-Yssel; Paradis d'Avroy and Boverie Colliery Company, April 2, at Liége; Bonne-Espérance and Batterie Colliery Company, April 6, at Liége; United Collieries Company of the Lower Sambre, April 7, at Tamines; Belle-Vue Colliery Company, April 8, at Liége; Bois Colliery Company, April 9, at Quaregnon; Haine St. Pierre Forges, Ironworks, and Foundries Company, April 11, at Brussels, &c.

There is little change to note in the state of the French iron trade, a considerable amount of stagnation still prevailing. It is stated that the Government has decided on stimulating great works on the part of railway companies; and whether this is the case or not, it appears certain that important orders for fixed plant will be soon given out by some companies. It is reported that certain establishments owned by the Basse-Indre Forges Company, at Nantes, and in the Loire Inférieure, will be shortly closed. The council of administration of the Carmaux Mines Company will propose to fix the dividend for 1867 at 19s. 2d. per share. The Marseilles Gas Company (with which undertaking the Portes and Sénéchas Mines are associated) will pay, April 1, a dividend of 9s. 6d. per share on account of 1867. Meetings are announced as follows:—Bonne-Espérance and Bonne-Veine United Collieries Company, March 28, at Paris; Montebras Tin Mines Company (Limited), March 28, at Paris; Commentry Colliery and Fourchambault Forges and Foundries Company, March 28, at Paris; Metallurgical and Coal Mining Company of the Asturias, March 30, at Paris; Haute-Loire Coal Mines Company, March 30, at Paris; Montieux Coal Mines Company, March 31, at Paris; Lobsann Mines Company, March 31, at Strasburg; Rosdorff Mines Company, April 2, at Paris; Carmaux Mines Company, April 4, at Paris; Pont de Loup Sud Colliery, April 8, at Paris; Grand' Combe Mines Company, April 18, at Paris, &c.

Chilian copper has been rather weaker at Havre, at 75*l.* per ton, at which 75 tons have changed hands, the lot to be delivered at the close of May, with Paris conditions as to payment. Scarcely any sale of disposable Chilian has been noted at Havre; the last transaction recorded was at 75*l.* per ton. At Paris, tough English has made 78*l.*; Chilian in bars, 75*l.*; ditto in ingots, 77*l.* to 78*l.*; and Corocoro mineral, 75*l.* 10s. to 76*l.* per ton. The article has maintained itself well on the German markets, and has not experienced any sensible change in prices. Banca tin has been sought after at Amsterdam and Rotterdam, and has given rise to sustained affairs, at 53½ fls. to 54 fls. and 54½ fls. Billiton has been dealt in at 53 fls. to 53½ fls. On the French markets the demand for tin has presented little change, but it has somewhat revived in Germany. There have been important transactions in lead on the German markets, and prices have shown firmness. There has not been any sensible variation in zinc.

It appears that the imports of pig-iron, free of duty, into France amounted in 1867 to 55,300 tons, as compared with 64,845 tons in 1866. The imports of pig into France, with payment of duties, were 80,381 tons in 1867, as compared with 72,308 tons in 1866, making a total importation of pig into France last year of 135,681 tons as compared with 137,153 tons in 1866. The imports of plates and iron, free of duty, into France last year were 63,203 tons, as compared with 65,352 tons in 1866. The imports of plates and iron, with payment of duties, last year amounted to 6535 tons against 10,535 tons in 1866, making a total importation of plates and iron into France last year of 70,233 tons against 65,738 tons in 1866. The exports by warrants of pig, iron, and plates amounted to 113,786 tons in 1867, against 147,838 tons in 1866. The direct exports of pig, iron, plates, steel, and works in iron were 17,894 tons in 1867, against 19,767 tons in 1866. The quantities of pig and iron produced in each French group in 1866 and 1867 may be stated as follows:—

Group.	Pig—1867.	1866.	Iron—1867.	1866.
1.—Aveyron	33,334	34,988	36,875	41,865
2.—Ardennes, south of Moselle	102,714	111,219	61,602	75,798
3.—Paris basin	26,907	26,000	42,236	45,505
4.—Centre	128,230	128,876	92,422	104,694
5.—Champagne	107,616	133,731	72,494	79,559
6.—Comté	55,971	74,891	49,702	55,053
7.—Corsica	11,108	14,946	594	620
8.—Creusot	122,129	115,090	100,222	100,102
9.—Escaut	65,864	71,357	56,472	63,863
10.—Gard & Bouches-du-Rhone	47,151	39,156	18,552	19,856
11.—Loire	176,147	192,107	119,894	124,468
12.—North of the Moselle	229,215	175,327	95,552	91,029
13.—North-west	23,648	25,189	13,689	18,322
14.—Sambre	60,268	77,864	77,068	68,064
15.—South-west	32,061	31,912	11,239	10,575
Total	1,222,363	1,252,653	848,613	899,373

It will be seen by these figures that the production of pig presented in 1867 a diminution of 30,290 tons as compared with 1866, while the make of iron in 1867 was 50,760 tons below the corresponding total for 1866. The quantities of minerals imported into France in 1866 and 1867 were as follows:—

Source of supply.	1867.	1866.
England ....Tons	—	1,674
Belgium	125,840	138,974
German Association	64,867	63,577
Spain	56,443	52,289
Kingdom of Italy	72,716	81,084
Switzerland	2,583	2,002
Algeria	168,613	109,769
Other countries	489	2,362

It will be remarked that the receipts of minerals from Algeria are greatly increasing in importance, while those from Belgium are declining, and those from England have completely ceased. It would appear that the consumption of both pig and iron somewhat fell off in France in 1867, while stocks increased last year in the various metallurgical groups,—a state of affairs which explains the feebleness prevailing in prices. The five establishments which apply themselves to the manufacture of steel in France delivered in 1867 nearly 20,000 tons for consumption, this make being divided among the various producing establishments as follows:—Châtillon and Commentry, 117 tons; Dietrich and Co., 764 tons; Terre-Noire Company, 5236 tons; Imphy St. Seurin Company, 6518 tons; and Petin, Gaudet, and Co., 7238 tons. Rails figured in last year's steel production for 10,967 tons. In 1866 the total production of steel in France was only 10,790 tons. During the last few weeks the Northern of France Railway Company has ordered 10 tons of iron rails, to be delivered at La Chapelle, at 9*l.* 12s. per ton (taken by the Châtillon and Commentry Forges Company); thirty turn-tables, of 16 feet diameter, at 9*l.* 7s. 6d. per ton, to be delivered at Laon (which was taken by MM. Haldy, Roechling, and Co.); a hydraulic crane, at 15*l.* 18s. 4d. per ton, by the house of Hamoir, and 70 tons of cast-iron water-pipes, at various prices. The Creusot Ironworks and the Loire Forges Company have just shared an order for 15,000 tons of iron rails, to be delivered at Trieste, at 7*l.* 12s. per ton. The Northern of France Railway Company has ordered 12,000 tons of iron rails from the Maubeuge Forges Company, but the terms have not transpired. It is announced that MM. Petin, Gaudet, and Co. have obtained an order for 10,000 tons of Bessemer steel rails for a railway in the United States, at a price which approaches 16*l.* per ton, delivered at the port of embarkation; it is right to remark that this announcement requires confirmation. The Châtillon and Commentry Forges Company has obtained a contract for the plates required for two armour-plated frigates, recently commenced. The Western of France Railway Company has ordered 3000 tons of Bessemer steel rails from the Terre-Noire Works. This order carries the total quantity of rails of this description, ordered by the Western of France Company, to 32,000 tons. The Carmaux Mines Company proposes to fix the dividend for 1867 at 19s. 2d. per share.

The tone of the Prussian iron trade is not altogether satisfactory, confidence, which had been shaken by apprehensions of war, not having been altogether re-established, reviving only slowly. The fear, indeed, of a war with France has not yet completely disappeared, although it is subsiding more and more. As regards rails, it may be observed that the administrations of various Prussian lines are aiming at extensions of their systems, and are proposing to lay down second lines of rails. The Thuringian Railway Company has ordered 6000 tons of rails from Messrs. Falkenroth, Kocher, and Co., at Haspe, from the Phœnix Company, at Laar, near Ruhrort, and from the Hœrde Company; the deliveries are to be completed in the course of this year. The administration of the Moin and Weser has ordered 1500 tons of rails. The administration of the Rhenish Railway has confided to the house of Eberh, Hoesch, and Sons, of Duren, a contract for 4000 tons of rails, at 9*l.* 9s. 6d. per ton, a guarantee being given for five years. Pig has been tending downwards in Prussia; grey pig, No. 1, has made 3*l.* 16s. 8d. to 4*l.* per ton; ditto No. 2, 3*l.* 12s. to 3*l.* 15s. 4d. per ton; and pig for puddling purposes, 3*l.* 8s. to 3*l.* 10s. 6d. per ton. Prussia and Austria have just concluded a treaty of commerce, to which we may possibly make some further reference.

AUSTRALIAN MINES.

YUDANAMUTANA COPPER.—Capt. Terrell (Jan. 27) reports—Blinman Mine: The lode in bottom of No. 2 winze has greatly improved; and the other points of operation are quite as rich as mentioned in last report. We continue raising a large quantity of ore, and as soon as the cross-cut is driven under the winze we shall be able to raise not only an increased quantity, but at less expense. The lower we sink the better the lodes look, and there is twice the quantity of ore in sight now than there was last September. The quantity of copper made since last report is 49 tons, and that quantity would have been much larger but for the Christmas holidays, during nine days of which nothing was done at the smelting works. Everything is now going on satisfactorily. The quantity of rough copper sold at Adelaide during the month was 68 tons, realising nett 4628*l.* 4s. 8d., and 32 tons were in course of transit to port.

GREAT NORTHERN COPPER.—Capt. Tonkin reports—The winze west of cross-cut is looking very kindly, and promises to make ore shortly in paying quantities. The lode in the eastern end of the winze is 1 ft. wide; the other part is not so good, but improving as we go down. I shall sink this winze with all possible speed, and I believe that success will crown our efforts.

WORTHING.—The lode in the 83 has just been cut; it appears strong and powerful, with very rich ore, and the ground easy for driving. The cutting of this has unwatered the 73, so that better results may now be looked for. We expect we have struck the lode at the 63 south, which will soon drain the 53, when we shall be able to sink winzes and cut out stopes, so as to drive south under the shoots of ore gone down in the bottom of that level. We have in course of shipment about 25 tons of copper, and should have had 15 more but for the giving way of the bottom of the refinery. This copper is tougher than the first, and should realise the highest price. There can be no doubt as to the policy of making our own, being perfectly satisfied that it pays. Ore raised, 150 tons; number of hands employed, 112.

PORT PHILLIP AND COLONIAL GOLD.—The quantity of quartz crushed during the four weeks of December was 4994 tons, yielding 2355 oz. 13 dwt. of gold, or an average of 9 dwts. 10 grains per ton, including gold from pyrites. The receipts were 8587*l.* 9s. 2d. The payments (including 2680*l.* for firewood and mine timber) were 6681*l.* 4s. 4d. The profit was 1906*l.* 4s. 8d., making, with the balance carrried over from last month of 2814*l.* 16s., less 235*l.* 10s. 6d. paid for securing the creek over the old workings of the Clunes United Company, a portion of which will be repaid, an available balance of 4485*l.* 10s. 4d. Out of this sum we divided 2000*l.* between the two companies, the Port Phillip Company's proportion being 1300*l.* The balance of 2485*l.* 10s. 4d. being carried forward to next month on firewood account. The machinery is all working very well, including the Birch's Creek plant, which is amply supplying the works with fresh water. The return for the four weeks of January is:—Quantity of quartz crushed 4311 tons; yield, 2084 ozs. 14 dwts. of gold, or an average of 9 dwts. 16 grs. per ton, exclusive of pyrites gold. The remittances are 1710*l.* 3s. 11d.

ENGLISH AND AUSTRALIAN COPPER.—The quantity of coal at Kooringa was 335 tons; at Kapunda, 124 tons; and at Port Adelaide, 527 tons. There were four furnaces and one refinery at work. Since last advices a further small shipment of 20 tons copper had been made.

SCOTTISH AUSTRALIAN.—The directors have advices from Sydney dated Feb. 1, with reports from Lambton Colliery to Jan. 27. The sales of coal for the month of December amounted to 14,116 tons, making a total sale for the year 1867 of 178,751 tons.

CADIANGULLONG COPPER.—During the month there were sampled from the mine 50 tons of ore, which were raised by the few tributers then still at work.—Smelting Works: There have been shipped to London by the Colonial Empire 8½ tons of fine copper, and there were in store at Sydney 8 tons more, at the works 8 tons, and it was expected that from the remnant of ores and metal in hand and in the furnace bottoms an additional quantity of not less than 14⅛ tons of fine copper would be made and dispatched from the works before suspending all smelting and mining operations on the property.

YORKE PENINSULA.—The committee of inspection at Adelaide report that they have appointed Capt. Thomas Anthony to direct and superintend the renewed operations at the Kurilla, and the following are extracts from his report:—I began work on Jan. 8 by examining the engine and boilers, and after cleansing and repairing them, set the engine to work on the 11th, and succeeded in draining the mine to bottom (the 35 level from surface) by the 15th......In the 15, 25, and 35-fm. levels the lode has expanded to three or four times its usual size, at a point from 10 to 12 fms. east of Hall's engine-shaft; and it has improved in quality as well as in size. This change is, no doubt, caused by the lode coming into contact with a small "slide," or curved "head," apparent in all the levels named. At the 35 east this slide is about 11½ fms. from Hall's shaft; here the lode is from 6 to 7 ft. wide, containing good yellow ore, which will, I have no doubt, work by-and-bye at a medium "tribute." It will not be available, however, until the winze begun at the 25 east is holed to the 35. With this object I have set the said winze to six men at 20*l.* per fm. It is now 2 fms. 4 ft. deep, with 6 fms. to sink. The lode in this winze is 3 ft. wide, composed of quartz carbonate of iron, mundic, and yellow copper ore, but the ore is so scattered throughout the lode that it will not much more than pay for dressing. The 35 is driven east of Hall's engine-shaft to within 3½ fms. of where the winze will hole. I shall, all being well, set this for driving during the ensuing week. The lode here is poor. I may remark that the lode along the slide, before referred to, shows a marked improvement in the 25 over the 15, and still greater at the 35, and there is every probability of still further improvement in depth. As regards the ultimate value of this mine, sinking and driving on the course of the lode is the only thing that will prove it......I would recommend you to sink Hall's shaft and drive the 45, when reached, both east and west on the course of the lode. This will at least give you a pretty correct idea of what it is likely to make still deeper......In favour of this lode, it may be argued, that it is within half a mile of the ore-producing lodes at the Wallaroo Mine, and there is no marked dissimilarity in the various strata surrounding the lodes in both mines—indeed, both geologically and geograpically there is a striking parallelism apparent. I do not hesitate to say that this mine is most favourably situated, and that no reason can be adduced to show why it may not turn out well.

FORTUNE COPPER (W.A.)—Mr. Samson advises (Feb. 5) of having shipped 30 tons lead ore per Kestrel *via* Sydney, and arranged to ship from 100 to 150 tons in the Hougoumont.

FOREIGN MINES.

ST. JOHN DEL REY.—The managing director (Mr. John Hockin) has issued a circular with the last advices of Mr. Gordon. The noxious vapour had been expelled from the mine, and examinations above the surface of the debris were being carefully made. Two further examinations, it was thought, would enable the mine conference to determine whether it would not be practicable to reach the ore ground in the upper part of the East Cachoeira through the existing excavation, which, if practicable, would occupy much less time than a new shaft. In the meantime the directors have submitted a plan for the consideration of the mine conference of reaching the Bahu lode from the westward. In regard to the Gaia Mine, it will be seen from the extracts from the diary that more regular results may be looked for in March. Many enquiries having been made in regard to the financial position of the company, the directors think it may be satisfactory to the shareholders to have a financial statement, including all known payments to June 30 next. The balance at bankers is 36,474*l.* 16s. 5d., against which the drafts and payments to be met amount to 25,233*l.*, leaving a surplus of 11,242*l.* 16s. 5d., and to this must be added 8000*l.*, the estimated value of gold to arrive in May. The reserve found on March 20 amounted to 48,074*l.* 3s. 1d.

DON PEDRO NORTH DEL REY GOLD.—Capt. T. Treloar: The gold return for January amounts to 11,105 oitavas (equal to 1281 ozs. troy)—profit, 2700*l.* 5s. 8d. The produce exceeds that for December by 916 oits., and a fair profit on the month's work has been the result.—Mine: The operations generally have proceeded satisfactorily; all the lines of gold have been worked on, but Nos. 3 and 4 to a greater extent than Nos. 1 and 2. No. 1 line is poor, and at present difficult to trace; in fact, I suspect it is heaved by one of the fissures. No. 2 has also been poor, but the line is well defined. A small quantity of inferior vein stuff has been taken from No. 3 vein, and the ground is becoming moist,

indicating that we are approaching water. The line No. 4 has afforded vein stuff, but very changeable in yield; sometimes very poor, and at others yielding well. The general work has gone on as usual. The near approach to water at line No. 3 will necessitate the pushing on the shallow adit. This has and will be done. Progress, too, has been made in the middle and deep adits. The work at the other parts of the mine has been carried on with as much speed as our force would admit of. Rogers's cross-cut we are driving west through the flookan and, so far as we can now judge, this flookan is about 12 fms. wide. First portion of February.—Extract from Mr. Symons' letter, dated Feb. 18: The operations are proceeding steadily, and nothing of moment has occurred since the last letter. We have taken veinstuff from No. 4 shoot—the last lot was not so good. Both this shoot and No. 3 are wet. In the exploratory works there is nothing new. The shallow adit is being pushed on with. The gold cleaned up to date amounts to 4386 oitavas.

ANGLO-BRAZILIAN GOLD.—Captain T. Treloar:—The gold return for January amounts to 2058 oits. (237 oz. troy). The operations at the several sections have been prosecuted with vigour. In the Buraco Secco the lode in the bottom is very poor—so poor that it has been found advisable to suspend operations at this point until more force appears, and remove the borers to the lode in the western part of the same mine. The stone from Haymen's shaft continues poor. At the north of Dawson's fair progress has been made, and we have holed with a borer to the tanks above, or bottoms between Dawson's and Haymen's shafts. About 2 ft. more remains to be driven before the old workings can be freely communicated with. The lode in Dawson's Canoa has become disordered by killas, but it maintains its size, and there is no apparent falling off in the yield. At Dawson's south the extension of the level has been carried on with all dispatch, but the old workings have not been reached. These, however, must now be very near. Westward of this level we are rising towards the tanks above, with the view of draining them, and thereby obtaining admission to the old workings in the Mina Grande. In the deep adit the lode is poor. This point is pushed on with all speed at our command towards the Fundao. At Foster's the lode in the shaft is small, but its auriferous quality is good. In the stopes west of this shaft the lode, which is composed of quartz and caco, is yielding favourably. First portion of February.—Extract from Mr. F. S. Symons' letter, dated Feb. 18.—"Mine: The operations are progressing steadily, and, on the whole, the features manifest an improvement, particularly to be noted in the lode south of Foster's. A communication has been opened north of Dawson's to old workings between Haymen's and Dawson's; a large quantity of mud and other debris, the accumulation of many years, has to be cleared out before we can break any large quantity of stone. In Dawson's south we are still working vigorously to unwater tanks and old workings between Foster's and Dawson's. A large stream of water is coming from end; long borer holes have been driven with a view of touching water in old tanks, but to date have not been successful. A large force is concentrated in this section."

ROSSA GRANDE GOLD.—Ernest Hilcke: Our operations are going on very satisfactorily; the air shaft referred to in my last report has been sunk 5 fathoms; a horse whim is put up, and commencement has been made to lay down a tramroad. A turn from the adit to the level, 4 fathoms in breadth, has been commenced and completed, in order to make convenience for the tramroad, also to obtain better ventilation. In this, however, we experienced but little improvement, and even by putting up a second air machine it did not give us the wanted ventilation; and only by erecting a larger and more powerful fan, driven by a 9-ft. wheel, and by putting up larger air pipes, we have succeeded in obtaining sufficient air for either driving the level or going on with the stoping. But as it is of the greatest importance to communicate the adit level with the shaft with as little delay of time as possible, we have resumed driving the level and suspended the stoping until the above mentioned communication will be finished, which, I think, can be done in about four months more. After this difficulty is overcome and the stoping can be resumed, there is no doubt we shall have a good and a lasting lode here, which I have no fear will yield great riches.—Jacotinga Exploration: A cross-cut, 11 fathoms in length, has been driven in the most promising place, of an iron formation, existing on the south part of the property towards Gongo. In the end of this cross-cut we have intersected with a dark and sandy formation, which leads to the expectation that jacotinga is no very far off.—Produce: In this month 314 tons of formation have been treated, and was derived partly from the '2d workings,' and partly from the turn of the adit to the level, which yielded only 281 oits. of gold. The produce, I fear, will keep low for some months to come, on account of not being able to go on with the stoping.—First portion of February—Operations: The works are going on well, the air-shaft is sunk 4 fathoms since January, the ground is very favourable for sinking, but its auriferous nature is so far very poor. We have not yet intersected jacotinga in the cross-cut, but the formation in the end of same is very promising, and what is greatly encouraging in sampling, it shows small particles of gold.

MINING IN EASTERN NEVADA, U.S.

[*From our Correspondent.*]

The Stetefeldt furnace, for chloridising silver ores, of which I have made mention heretofore, bids fair to supersede entirely the old process of calcination in Eastern Nevada. The ore roasted in this furnace presents a very uniform appearance, scarcely any, the least portion of it being either burned or "sintered." In the experiments made, the walls of the shaft never attained their normal heat, yet the chlorodising of the ore was almost perfect. The ore passing through a shaft of only 25 feet in height, was chloridised from 83 to 87 per cent., while most of the fine dust reached 89 to 90¼ per cent. Mr. Stetefeldt believes, however, that the chlorination would be higher in a shaft of greater height. It is to be noted that the pulp used in the experiments contained a great deal of grit, owing to a defect in the battery, and the coarse material could not be so perfectly roasted. In order to fully appreciate these results, it is necessary to know how far the chlorination of silver is perfected in the reverberatory furnace. From a great number of tests made with samples of roasted ore from different mills in Austin, it was found that only 75 to 85 per cent. of the silver contained in the roasted ore was chloridised, the yield depending upon the more or less careful manipulation of the workmen, and the professional skill of the foreman of the mill. One of the highest results was obtained at the Mattacom mill, where the proportion of silver chloridised reached 90 per cent. At the mill of the Twin River Company, where the roasting is conducted with more than ordinary care, the chlorination of silver in the ore generally reaches 90 to 92 per cent. The ore roasted in the Stetefeldt furnace, having the advantage of being entirely free from burned or "sintered" pieces (an occurrence which cannot be avoided in a reverberatory furnace), is in the best condition for amalgamation, and as grinding of the ore would not be required, it is easily adapted to the barrel process. Below is an estimate of the comparative expense of roasting ore in the Stetefeldt and reverberatory furnaces. Besides the great saving in manual labour, fuel, and salt, the new furnace has other advantages which should not be overlooked. One of them is the much smaller expense in construction, both as regards the furnace and the building which should cover it. This difference in cost will amount to at least 30 per cent. And large as this reduction is, the Stetefeldt furnace would yet be built of the best material, and would be far more durable than the reverberatory furnace as it is ordinarily built in this country; at the same time the new chloridising furnace would be connected with an extensive system of dust chambers, by which the mechanical loss of fine dust, which is far more considerable than most men suppose, will be reduced to a minimum. There would be another decided advantage in the management of a mill, as the force of workmen would be reduced to one-half of what it is at present, and the roasting of the ore, the really important feature of the business, could receive proper attention from the superintendent. The ore roasted in the Stetefeldt furnace produces finer bullion than that roasted in the reverberatory furnace, for the reason that the chlorides of the base metals are decomposed, and this result cannot be appreciated too highly.

Estimated expense of roasting 16 tons of ore at the Twin River Mill:—

IN EIGHT REVERBERATORY FURNACES.	
24 roasters, at $4 each per day	$96·00
2 foremen, at $5 each per day	10·00
2 carmen, at $4 each per day	8·00
2 pulp coolers, at $4 each per day	8·00
7 cords of wood, at $8·50 per cord	59·50
12 per cent. of salt, at $40 per ton	76·80
Material and repair of tools	12·00
Total cost	$270·30
IN STETEFELDT'S FURNACE.	
2 men to overlook machinery	$ 8·00
3 firemen, at $4·00 each	12·00
2 pulp coolers, at $4·00 each	8·00
3 cords of wood, at $8·50 per cord	25·50
8 per cent. of salt, $40·0 per ton	51·20
Line and tools	3·00
Total cost	$107·70

These comparative statements show a saving in roasting 16 tons of ore in the new over the old furnace of $162·70. The cost of roasting in the Stetefeldt furnace is less than $7 per ton, while in the old furnace it exceeds $16 per ton. The expense of roasting in the reverberatory furnace, when it is properly conducted to a good result, is not under the most favourable circumstances less than $15 per ton. Increasing their number does not materially lessen the expense per ton. On the other hand, the inventor of the new furnace is prepared to show that one of his possessing the capacity of 32 tons would not cost 25 per cent. more in construction than one half the size, while the expense of roasting would be reduced to about $5 per ton. These extraordinary results are entitled to the consideration of intelligent millmen everywhere.

Mining in Eastern Nevada is looking up materially as spring approaches. Never was the prospect brighter for a good yield of bullion from every district where there is milling facilities. The new 40 stamp-mill of the Combination Company, situated at Belmont, Nye county, turned out and shipped refined bullion amounting, in the aggregate, to over $25,000, being the result of the first week's run of the mill; this, in the future, will materially increase the quarterly returns of Nye county, which will, doubtless, soon be one of the most productive silver-producing counties in the State. The bullion product of this county for the quarter ending December 31, 1867, was as follows:—Aggregate amount of ore worked from all parts of the county, 2325 tons, yielding $318,423, being an average of $139·92 per ton. With the exception of Silver Bend, the average yield of the ores of all the districts was high. The ores of Silver Bend, which are undoubtedly of superior quality, were treated without roasting, by which process it is safe to estimate they did not yield to exceed 30 to 40 per cent. of their silver. It will be safe to hazard the judgment that before the expiration of the present year the valuable ores of that district will produce an average of upwards of $125 per ton. Up to the present, the only mill running in the district is that of the Belmont Company, which has thus far worked their ores without roasting. The valuable tailings from this mill are caught in large vats, from which they are taken to a yard, and spread in layers; these layers are sprinkled with salt, which, with the atmosphere and sunlight, will prepare them for more perfect reduction in the future. There are at present on the grounds of the company over 3000 tons of tailings, which assay from $25 to $40 of silver per ton. It is said that this company purpose the erection of a Stetefeldt furnace for the convenience of their mill.

For the past year and a-half Mr. J. Ross Browne, special agent of the Government, has been preparing a report showing the mineral resources of the states and territories west of the Rocky Mountains. This report has just been published and sent to Congress. The production of the precious metals in the United States, from 1848 to 1867, is thus set down:—California, $900,000,000; Nevada, $76,000,000; Montana, $65,000,000; Idaho, $45,000,000; Washington, $10,000,000; Colorado, $25,000,000; Oregon, $20,000,000; New Mexico and Arizona, $5,000,000; miscellaneous, $45,000,000; retained for jewellery, plate, &c., $50,000,000: total, $1,241,000,000. The production for 1867 is thus stated:—California, $25,000,000; Nevada, $20,000,000; Montana, $12,000,000; Idaho, $6,500,000; Washington, $1,000,000; Oregon, $2,000,000; Colorado, $2,500,000; New Mexico and Arizona, $1,000,000; miscellaneous, $5,000,000: total, $75,000,000: making a grand total, up to the commencement of the present year, amounting to $1,316,000,000. The product of all the states and territories, save that of Nevada, is principally gold, which is washed from the placer diggings, but Nevada's product is almost exclusively silver, found in well-defined and permanent quartz ledges, giving this State an advantage for permanent and profitable investment that can be claimed by no other section yet discovered.

LITERARY NOTICES.

Life of James Ferguson, F.R.S., in a brief Autobiographical Account, and further extended Memoir. By E. HENDERSON, LL.D. London and Edinburgh: A. Fullarton and Co. 8vo.

This handsome volume, of more than 500 pages, is dedicated to the late Sir David Brewster, and illustrated with a portrait of the astronomer, and 115 woodcuts, consisting of views, portraits, and scientific diagrams, beautifully engraved. James Ferguson was born in the year 1710, at Quoir, about 11 miles east of Keith, in the parish of Rothiemay, in the North of Scotland; and died at his residence, 4, Bolt-court, Fleet-street, London, Nov. 16, 1776, aged 66 years. His altar tomb is in Old St. Mary-le-Bone Churchyard.

In the summer of 1827 Dr. Henderson became acquainted with Ferguson's "Select Mechanical Exercises," containing a "Short Account of the Author," from which time to the present he seems to have dedicated himself to supplying the deficiencies of that very delightful piece of autobiography. Forty years of collecting and arranging materials evinces that irrepressible enthusiasm without which no great works, nothing of importance to society, and the advance of intelligence is ever achieved. Dr. Ebenezer Henderson, the author and editor of the work before us, was named after his uncle, the late Rev. Ebenezer Henderson, who was for 25 years one of the Professors in Highbury College, near London, and who died about 10 years ago. He has zealously, labouriously, and lovingly performed his mission. His memoir of Ferguson is of a most exhaustive character, written for all time, not easily to be curtailed, and will, it is most likely, never be enlarged. It consists of two parts and an appendix; the first part supplies Ferguson's memoir of himself, to which is added illustrative vignettes and valuable notes; then follows the second part, being Dr. Henderson's extended memoir of the astronomer from 1743 to 1776, certainly a most valuable addition to our scientific literature, for although Ferguson, shortly before his disease, in 1776, published an account of his early life, he omitted all notice of the last 30 years of his career, a deficiency which no less than four writers have unsuccessfully attempted to supply. Dr. Henderson has combatted every difficulty with the most fortunate and fruitful results, culled from a lately discovered Common Place Book, from reviews and notices of Ferguson's publications and inventions, as well as other materials acquired during the last 36 years.

The child that could teach itself to read, notice and feel an interest in mechanical operations, construct amusive and useful automata, and measure the distances of the stars with a string of beads, well merits to be distinguished as evincing remarkable genius. He has often been spoken of as a born astronomer and a self-made man, and he affords an exemplary pattern to the rising generation. What might Ferguson not have been had he possessed a tithe of the educational advantages of the gentry and the working men of the present day.

In 1743 he left Edinburgh for London, after the primitive fashion of those days, in a smack from Leith, with his wife, their wardrobe, and his astronomical apparatus, arriving in the metropolis after a tedious passage of seven days. His biographer is inclined to think that he would never have risen to eminence as a merely mathematical tutor, his mind being of a purely mechanical turn. He never understood Euclid; his constant method to satisfy himself of the truth of any problem was by measurement with scale and compasses. In process of time, however, he became a lecturer on natural and experimental philosophy, of world-wide renown, as well as the author of many scientific works and papers, and at his death he left a considerable funded property. In 1762 a royal pension of 25l. was granted to Ferguson, which gave him a position in the world honourable to himself and of advantage in prosecuting his profession as lecturer on astronomy and general science. In 1763 he was elected a Fellow of the Royal Society, and it was resolved that he "on account of his singular merit, and of his circumstances, be excused the usual admission fee, as also the annual contributions." Thus far, until about 1763, we find Ferguson lecturing, writing, inventing machines and apparatus, and variously and actively employed in acute philosophical studies and investigations. But, alas! even the philosopher's path is not free from heart-rending pangs. Walking along the Strand with his daughter Agnes, of about the age of sweet seventeen, a "noble lord" inveigled her from him, ruined her, conveyed her to Italy, deserted her, and returning to London she perished in squalid poverty, at something like 46 years of age. This sad, sorrowful story of domestic affliction is first recorded in a detailed form in the present work. The unfortunate parents were happily saved the affliction of acquaintance with the terrible results of their daughter's abduction. Dr. Henderson acknowledges the great advantages he has derived from Ferguson's Common Place Book, a manuscript folio, discovered three years ago in Edinburgh, which has been deposited in the College Library, with two other 4to manuscripts.

We have thus briefly, and certainly very imperfectly, marked the features of Dr. Henderson's laborious, valuable, and interesting eventful "Life of James Ferguson." Where everything has to be preserved, as here, in a first complete memoir of a singularly talented man, the petulant may find much to mar their sense of sensational selection, but it is from works like Dr. Henderson's that the compiler of popular literary productions skim the cream of their labours. And we have often had occasion to remark on the difficulty of pleasing all tastes, in even the single matter of biography,—if you omit anything that is a fault, and if you give every item you are too exact and minute; so that between the two extremes it is difficult at the same time to satisfy that class of readers who require the honey without wax, and those who prefer the sweet in the honeycomb. It is nearly a century since the death of the astronomer, and during that period Dr. Henderson's is the fifth biographer who has attempted the labour of love to complete what Ferguson in his own memoir has left meagre in the first instance, and for the latter part of his life imperfect. There was a hiatus to be filled up,—not with guesses but with facts, not with surmises and fictions, to gratify the thoughtless, but with stern realities, everywhere vouched for and indisputably authenticated. We have to be told all the particulars of the shepherd boy's birth, education, and star-gazing; his levers, clocks, and globes; travels, drawing, and lecturing; his orrery, and Trajectorem Lunare and curve of the Moon's orbit; astronomical, select, and other lectures; his books, tracts, memoirs, and letters; his friends, acquaintances, family, pursuits, and all that appertains to quiet philosophical studies. And all this has to be carefully, cautiously, and circumstantially stated. Such lives are mosaics, that cannot be dashed off at a heat. The solidity and stability of the superstructure depends on the sufficiency of the materials, and their nice and proper adjustment. We do not envy those readers who cannot appreciate books like the present, whose weak digestion requires the most delicate and approved morsels, and who relish nothing in quantity that falls short of such morbid taste. The tendency of the age is to encourage light and sensational literature, to sigh for knowledge but to suck it only from lectures, and expect instruction through contact with men and books without paying the penalties of study in solitude, reading, and writing. Dr. Henderson's work will recommend itself to scholars, and to all sober-minded, intelligent readers, who, loving knowledge for its own sake, never tire of the life-history of its ardent, enthusiastic pursuers, and can in the present instance dwell with delight on the passing scene from early star-gazing to the period of the veteran astronomer's closing career. Its excellent list of contents, and, finally, its copious index, render this "Life" a work of agreeable and easy reference, for which, together with its other merits, we strongly recommend it to every lover of learning, and to all who, like Ferguson, find that they pursue knowledge under many difficulties.

THE HAUNTS AND HOMES OF CORNISHMEN.

The writings of the late Mr. I. T. TREGELLAS have so long enjoyed the reputation of being at once entertaining and instructive that commendation is altogether unnecessary to secure the recognition of the merits of the volume just issued by Mr. J. R. Netherton, of Truro, under the title of "Peeps into the Haunts and Homes of the Rural Population of Cornwall." It was ever the avowed object of Mr. Tregellas to place before his readers a tolerably exact picture of a Cornishman as he is, with all his rough sense of honour, his kind heart, his self-reliance, his *naiveté*, his ingenuity, and his keen, quiet powers of wit and observation. Himself, a thorough Cornishman by birth and association, and by all his predilections, and beloved accordingly by all good Cornishmen, he felt a complete sympathy with those whose characteristics he delighted to study and to reproduce. His genial good humour, unselfish motives, and kind-heartedness were a passport into all grades of society, and so entirely divested of all offensive personality was the kindly critic that, perhaps, none laughed more heartily at the display of some strange peculiarity of Cornish modes of thought or diction than those who themselves furnished the archer with his shaft. In the perusal of the entire volume nothing will be found to offend the feelings of the most sensitive, although some of the references are keen in the extreme. After giving a brief account of the peculiar intonations heard in the various parts of the county, the reader is introduced to a neatly-dressed widow—Martha Permewan—who, although she had recently lost her third husband, appeared to be in full possession of health and spirits, "wasn't never troubled with no demleen," and did not despair of yet availing herself of another matrimonial chance. Mr. Tregellas gives her reasons for retaining this hope as related by herself:—

"I've had three of um, but I baant too owld yet. My fust was a sumpman, and worked in the sump-shaft in Levant Mine; my second was a soort of pig butcher, and made a good dale of money in the smuggling line, and left me 20l. a year when aw was drownded, and that I've goat ever sence, and goat ut now too. And then I married a tailor what did praich sometimes, and was a soort of teetotaler in his way, and never drinked nothing but tay and sich like; and he was took with a shaade, and this day three weeks he died; and after he was dead they cut un open to see what was the matter weth un. But waun of the young doctors that helped to do ut towld me that he died all feer, but they cudn't find nothin' in un but grooshans (tea-grounds). I waant have nothin' of that soort agen, but I'll git a farmer with a little money, and so I oft to, for I've goat twenty pounds a year and a house to live un."

In the second chapter—On to St. Ives—there is an admirable sketch of a Cornish landlord and the tales he tells, but even this will prove less attractive to the readers of the Journal than that which is given concerning Capt. Joe, of Camborne, and the record may be instructive to many—

"Well, Capt. Joe, this is a great mining place, is it not?" "Iss, hundreds of mines around here, great and smale, and beginning and going to begin when they get companies for um." "And what is the principal mine here?" "Aw, there's a good many of um principal mines, but if I was you I'd take shares in one, I shud ax somebody about it fust. . . . Then there's —— ; good mines all of um, but nothin' like a little consarn I'm putting on myself ovvur here nigh Lanyon: there's ores there to grass for everybody to see: and putty ground to work, and laarge lodes nighly all copper, and a putty stream of waeter to pumpy and dressy weth, wethin haafe a mile of the sett, and nigh 'pon twenty foot fale for the waeter and a twentieth doos. Aw a putty thing sure 'nough. I shall caall her Wheal Butterfly, she es so good-looking. We shall rise thousans of ore there, and be into the tecketing to waunce. The shares are wuth a good deal of money I assure ee, but they arn't all fulled up yet. I'll tell ee what I'll do. I never seed a gentlemun in my life I loved the ways of better than you. Hark ee: I'll put thee down for a hunderd shares for nothin', and that'll make ee a director and all that. They're six thousans, and all you goat to pay me es 5s. a share for the entry; and I waent have a farthin' premium from ee, I waent, 'cause you're goin' to pay the reck'ning now, arn't ee? I'll have in a pen and some ink to write ut down, and you can accept it and draw your cheque to waunce, caent ee."

But the various sketches are all so excellent that it is almost impossible to make a selection, but, perhaps, especial attention may be directed to Ticketing Day and a Conversation, New things and blazing reports, Two guineas to look 'pon a consarn, Jim Trevaggas, the Inspection, the Report, and many others of a similar character. Indeed, it is a volume which should be thoroughly read and studied by all who have dealings with Cornishmen. The anecdotes and tales are at once original and humorous, and afford unmistakable pictures of the class depicted. The book is worthy of extensive patronage, and will, undoubtedly, receive it.

PETROLEUM IN ITALY.

An interesting treatise on this subject has just been issued (through Messrs. E. and F. N. Spon, of Charing-cross) under the title of "The Petroleum Zones of Italy," by Mr. E. ST. JOHN FAIRMAN, F.G.S. The author remarks that the Modenese Apennines are formed for the most part of a sombre kind of sandstone, called by the Tuscans macigno or pietra serena. Barigazzo has been noted for ages for the gas which emanates from a part of the mountains looking to the south. This gas burns spontaneously, but is sometimes extinguished by strong winds. Rain alone is not sufficient to put it out. Perhaps no spot in Italy, he says, is so rich in petroleum deposits as the Salsa di Querzolo; it is to be regretted that no borings have yet been made to obtain the petroleum in large quantities. At a distance of about half a mile from the Salsa di Sassuolo are the petroleum wells of Monte Gibbio. These wells are sunk in a soft kind of sandstone at the bottom of a valley. The water which infiltrates into them is about a foot in depth, and the petroleum floats on the top. It appears that the petroleum mud when thrown up from the ground forms conical mounds, and Mr. Fairman considers that the proper mode to obtain the petroleum would be to sink a well near the site of the largest cone, and to close up the mouths of the other cones with brick or stonework. He suggests that by this means the smaller outlets being cut off, and a sufficiently large outlet being established at one point for the escape of the whole of the gas, the petroleum would be collected into the one well.

In replying to the question—If petroleum is to be had so plentifully by boring for it, why do not the Italians work the deposits? Mr. Fairman remarks that there are many causes to which the apathy of the Italians to industrial pursuits may be attributed, and their insensibility to the mineral riches of the soil is to be found in the unsettled state of the nation after a political revolution which has dazzled their imaginations, and left them no breathing time to turn their talents to the practical development of the country through industrial pursuits. One of the richest products of Italy is sulphur, yet the Italians still receive their sulphuric acid from other countries. If the Italians, therefore, says Mr. Fairman, have been so backward in the matter of sulphur, is it any wonder that they should be hitherto so apathetic as regards other mineral products, petroleum, for instance? The internal riches contained in the Italian soil are unknown; they can be only in part guessed at, because no explorations of sufficient extent have been made. Fossil coal, for instance, is found on the surface, but then they say that it is only to be met with in isolated lumps. Who knows? Have borings been made to a sufficient depth, and in a sufficient number of sites? Certainly not. Until that is done, however, no person has a right to say that coal beds are not to be found in Italy, sufficient in extent to be worked as a commercial enterprise, or to obviate the necessity of importing so expensive an article, and so indispensable for the preparation of many of the minerals for the market. This is, in fact, the excuse of many Italians when accused of their want of energy in works of industry—"We have no coal." But it has been asserted by many geologists that coal actually exists, of good quality, and in large quantities, and moreover, they have pointed out the places where it ought to be looked for. Petroleum, however, is an article that does not require the aid of coal (or at all events in very small quantities) for its development, nor is complicated or expensive machinery a *sine qua non* for its production. The Italian petroleum, in its crude state, is limpid and pure, and requires merely to be separated from the water (an easy operation) to render it fit for the market.

But as the commercial value of the oil is that which capitalists naturally consider, the report of Prof. C. F. Chandler, of the School of Mines, Columbia College, New York, who analysed some Italian petroleum, will be particularly interesting. He says—While the Pennsylvania oils contain on the average 10 per cent. of gasolene, 10 per cent. of naptha, and only about 75 per cent. of illuminating and lubricating oils, the Italian oils are remarkable for the entire absence of gasolene, and in many cases of naphtha, the yield of illuminating and lubricating oil reaching from 88 to 97 per cent. This is greatly to the advantage of the Italian oils, as gasolene and naphtha bring very low prices in the market. The Italian oils are also distinguished by the absence of the offensive odour which characterises most of the American petroleum. Not one of the ten samples is disagreeable, while several of them are almost odourless; a circumstance which will tend to simplify the process of refining. The light colour of most of the samples is equally striking. In the reports of the analyses, all the oils having a density below 36° Baumé have been recorded as lubricating oil; the skilful refiner has it in his power to convert a great part of this into lighter illuminating oil by "cracking" (re-distilling very slowly) it, whenever the comparative market prices of the two oils make it profitable to do so. It must not be supposed, therefore, from the analyses, that the Italian oils will not yield much illuminating oil, for, on the contrary, they possess a great advantage in their weight, which makes it possible to obtain from them an unusually large yield of either illuminating or lubricating oil at pleasure.

In the treatise under consideration, Mr. Fairman has collected all the information obtainable in connection with the subject, and the result of his investigations are that he firmly believes in the feasibility of developing the petroleum question in Italy, that it will yet turn out to be the most fruitful source of revenue to the country that was ever conceived, and that the fortunate individuals who first enter the field will be rewarded beyond their most sanguine hopes.

THE FOREIGN AND COLONIAL GOVERNMENT TRUST.

The financial disasters of 1866-7, if they have left traces of ruin which it will take some time to efface, will be sure to produce changes of permanent benefit. The lesson inflicted has been too painful for it to be possible for old systems to be altogether persevered in. The first attempt in this direction bids fair to effect all that can be desired. The Foreign and Colonial Government Trust aims at placing the humble and necessarily cautious investor on as secure a footing as the millionaire. It is, in fact, the application of the system of co-operation, of which we have lately heard so much, to investments in public securities, creating a partnership without risk, but enabling every customer to share in the profits. Nothing can be more modest than the terms in which the promoters invite public support, and yet the advantages offered are so great and so self-evident as to make it wonderful that the idea should not long ago have been reduced to practice. The occurrences of the last two years might well have staggered the prudent, and discouraged those who hoped to turn their economies into a provident accumulation for advancing life, or a rising family. The Foreign and Colonial Government Trust is, however, a tempting premium to prudence and economy, as will be seen from the following statement of its provisions: it is proposed to raise a capital of 1,000,000l., by issuing 11,765 certificates of the value of 100l. each. These certificates are to bear interest at the rate of 6 per cent., but as they will be issued at 85l. each, the real rate of interest is 7 per cent. The capital so raised is to be invested in the dividend-paying stocks of certain Foreign and Colonial Governments, which are named, but not more than 100,000l. is to be placed in any one stock. The average rate of interest of these stocks is 8 per cent., and many of them are being paid off at par by annual drawings. It is clear, therefore, that the Foreign and Colonial Government Trust will always have an excess of interest to deal with, beyond the nominal 6 per cent., to be paid to their certificate-holders, increased considerably by the fact that their investments will be made below par, and in stocks many of which are being paid off at par by annual drawings.

The Trust will apply this excess of interest, after payment of expenses, to the formation of a sinking fund, which will be devoted to paying off their own certificates by annual drawings. By this process the whole of the 11,765 certificates will be paid off in 24 years. The certificate-holders will, therefore, have received his nominal 6 per cent. (really 7 per cent.) during the 24 years, have received back the whole of his capital by the annual drawings—he may be lucky enough to receive it back the first year of the 24—and will yet be entitled to his share of the value of all the stocks held by the Trust at the end of the operation, amounting, as estimated, to 909,409l. nominal capital. A Coupon of Reversion, applying to this last-named sum, will be attached to each original certificate. Thus, then, there is interest at 7 per cent. during the 24 years; a bonus of 15 per cent. by the certificate of 85l. being repaid at par; and a final share in the reversion of upwards of 900,000l. What will be the extra profit to the fortunate certificate-holders who may happen to hold the lucky numbers early turned up at the annual drawings in February is something to make one's mouth water, particularly when it is remembered that the man who may get all his investment returned to him in February, 1869, with 15 per cent. bonus, remains still entitled to his share in the grand and final reversion of the 900,000l. The charm of the scheme is that there is no risk after the investment, no after reckonings, no calls to make up deficiencies. The worst that can happen is that one or two of the Governments whose stocks have been purchased may prove temporary defaulters. Such a casualty would merely abridge the number of certificates annually extinguished by drawing, and might lessen the reversionary fund to be finally distributed. The Foreign and Colonial Government Trust is a guarantee against all future liabilities, except that of receiving liberal interest, and getting back the capital invested twice over, with the addition of a bonus of 15l. per cent. The idea is novel, and is a truly successful adaptation of the co-operative system in a way that will encounter no opposition, nor even cavil.

BILLS OF EXCHANGE.—In the case of Lebel *v.* Tucker, a bill of exchange had been drawn and accepted in England, where it was also made payable, and was subsequently endorsed in France by a person, also resident and domiciled in that country to another person, also resident and domiciled there. The endorsement was made in accordance with the law of England, and not according to that of France. The Court of Queen's Bench held that the endorsement was good, as being in accordance with English law, and that it is not the nationality of the parties, but that of the contract, which must be regarded. It was also held that a contract made in England cannot, so far as the liability of the original parties to it, be varied by the law of any foreign nation through which the instrument constituting it passes.

London: Printed by RICHARD MIDDLETON, and published by HENRY ENGLISH (the proprietors), at their offices, 26, FLEET STREET, E.C., where all communications are requested to be addressed.—*March* 28, 1868.